# *Current Clinical Strategies*

## Family Medicine

1997 Edition

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# Preface

Current Clinical Strategies, Family Medicine consolidates the three most popular CCS handbooks into a single compact manual. Internal Medicine, Pediatrics, Gynecology, and Obstetrics are all included. For each disease entity covered, the special nursing orders, diagnostic tests, and therapeutic alternatives are presented. It is the most currant sources for therapeutic strategies available, including up-to-the-minute information on the treatment of AIDS and other modern diseases. This reference provides help for physicians and medical students who would like to write comprehensive admitting orders; it prevents omission of important laboratory tests and therapeutic measures.

This manual is structured to allow the clinician to individualize patient care by selecting diagnostic tests based upon clinical indications, and then choose the clinically indicated treatment plan from the alternatives provided. Some of the specific orders may not be appropriate for a given patient, and the physician should use clinical judgement to select orders as required by the clinical picture.



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INTERNAL MEDICINE

# Cardiology

## Myocardial Infarction and Unstable Angina

1. **Admit to:** Monitored bed (CCU/MICU)
2. **Diagnosis:** Rule out MI
3 **Condition:**
4. **Vital signs:** q1h, then q6h. Call physician if pulse >90,<60; BP >150/90, <90/60; R>25, <12; T >38.5°C.
5. **Activity:** Bed rest with bedside commode.
7. **Nursing:** Guaiac stools. If patient has chest pain, obtain 12-lead ECG and call physician.
8. **Diet:** Cardiac diet, 1-2 gm sodium, low fat, low cholesterol diet. No caffeine or temperature extremes.
9. **IV Fluids:** D5W at TKO
10. **Special Medications:**
    -Oxygen 2-4 L/min by NC.
    -Aspirin 80 or 325 mg PO chew and swallow, then aspirin E.C. (Ecotrin)160 or 325 mg PO qd **OR**
    -Ticlopidine 250 mg bid (aspirin sensitive patient) **AND**
    -Heparin 5000-10,000 U bolus followed by heparin at 15 U/kg/h and adjust to PTT 1.5-2.0 x control.
    -Nitroglycerine Drip 15 mcg IV bolus, then 10 mcg/min infusion (50 mg in 250-500 mL D5W, 100-200 mcg/mL). Titrate in 5-10 mcg/min steps, up to 200-300 mcg/min; maintain systolic BP >90; titrate to control symptoms; keep heart rate <20% of baseline rate **OR**
    -Nitroglycerine SL, 0.4 mg (0.15-0.6 mg) SL q5min until pain free (up to 3 tabs)

**Thrombolytic Therapy in Myocardial Infarction:**
**Relative Contraindications to Thrombolytics:** Absence of ST-segment elevation, severe hypertension, cerebrovascular disease, relatively recent surgery (>2 wk), cardiopulmonary resuscitation.
**Absolute Contraindications to Thrombolytics:** Active internal bleeding, history of hemorrhagic stroke, head trauma, pregnancy, surgery within 2 wk, recent non-compressible vascular puncture.

**A. Streptokinase or Anistreplase (APSAC):**

1. Aspirin 325 mg chew and swallow now and qd **AND**
   Heparin 5000 U IV bolus **AND**
   Diphenhydramine 50 mg IV push **AND**
   Methylprednisolone 250 mg IV push.
2. Streptokinase - 1.5 million IU of streptokinase in 100 mL NS IV over 60 min **OR**
   Anistreplase (APSAC, Eminase), 30 units IV over 2-5min.
3. Heparin 10 U/kg/h IV after administration of streptokinase or anistreplase and maintain PTT 1.5-2 times control.
4. PTT, fibrinogen now **AND** q6h x 24h.
5. No IM or arterial punctures, watch IV for bleeding.

**OR**

**B. Recombinant tissue plasminogen activator (tPA):**

1. Aspirin, 325 mg chew and swallow now & qd. Heparin 5000 U IV bolus.
2. tPA 15 mg IVP over 2 min, followed by 0.75 mg/kg (max 50 mg) IV infusion over 30 min, followed by 0.5 mg/kg (max 35 mg) IV infusion over 60 min (total dose < 100 mg).
3. Start heparin 15 U/kg/h infusion after tPA, & adjust to PTT of 1.5-2 times control.
4. PTT & fibrinogen now & q6h x 24h. No IM or arterial punctures, watch IV for bleeding.
5. **Labs:** INR/PTT, thrombin time, FDP, fibrinogen, reptilase time, bleed time, type & screen.

**Beta-Blockers:** Contraindicated in presence of CHF.

-Metoprolol (Lopressor) 5 mg IV q2-5min x 3 doses; then 25 mg PO q6h x 48h, then 100 mg PO q12h; may give 2 mg IV q2h prn pulse > 70, hold if systolic BP <90 **OR**

-Esmolol hydrochloride (Brevibloc) 500 mcg/kg IV over 1 min, then 50 mcg/kg/min IV infusion, titrated to heart rate >60 (max 300 mcg/kg/min) **OR**

-Propranolol 0.1 mg/kg IV divided in 3 doses q5min; followed in 1h by 20-40 mg PO q6-8h (160-240 mg/d); propranolol-LA (Inderal-LA), 80-120 mg PO qd [60, 80, 120, 160 mg] **OR**

-Atenolol (Tenormin) 5-10 mg IV, then 50-100 mg PO qd, titrate to HR >60 (max 200 mg/d).

**Other Medications**

-Heparin 5000 U (100 U/kg) IV bolus followed by 1000 U/hr (15 U/kg); adjust to PTT 2-2.5 times control **OR** 5000 units SQ q8-12h.

-Isosorbide dinitrate (Isordil) 10-60 mg PO tid [5,10,20, 30,40 mg]; Sustained release, 40-80 mg PO q8-12h [40 mg]

**11. Symptomatic Medications:**

-Acetaminophen (Tylenol) 325-650 mg PO q4-6h prn headache.

-Lorazepam (Ativan) 1-2 mg PO tid or qid prn anxiety **OR**

-Zolpidem (Ambien) 5-10 mg qhs, use 5 mg for elderly **OR**

-Diphenhydramine (Benadryl) 25-50 mg PO qhs prn sleep.

-Docusate (Colace) 100-250 mg PO bid.

-Dimenhydrinate (Dramamine) 25-50 mg IV over 2-5 min q4-6h or 50 mg PO q4-6h prn nausea.

-Ranitidine (Zantac) 150 mg PO bid or 50 mg IV q8h.

-Mylanta 30 mL PO qid prn heartburn.

**12. Extras:** ECG stat and in 12h and in AM. Repeat if chest pain; portable CXR, echocardiogram or radionuclide ventriculogram. Cardiology consult.

**13. Labs:** SMA7 & 12, magnesium. Cardiac enzymes: CPK, CPK-MB, STAT & q6h x 24h. LDH & isoenzymes. CBC; fasting cholesterol, HDL, triglyceride. INR/PTT, UA.

**14. Other Orders and Meds:**

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# Congestive Heart Failure

1. **Admit to:**
2. **Diagnosis:** Congestive Heart Failure
3. **Condition:**
4. **Vital signs:** q1h. Call physician if P>120; BP >150/100 <80/60; T >38.5°C; R >25 <10.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Daily weights, measure inputs and outputs, Head of bed at 45 degrees, legs elevated.
7. **Diet:** 1-2 gm salt, cardiac diet.
8. **IV Fluids:** Hep-lock with flush q shift.
9. **Special Medications:**
   -Oxygen 2-4 L/min by NC.

**Diuretics:**

-Furosemide 10-160 mg IV qd or 20-80 mg PO qAM [20,40,80 mg] **OR**
-Bumetanide (Bumex) 0.5-1 mg IV q2-3h until response; then 0.5-1.0 mg IV q8-24h (max 10 mg/d); or 0.5-2.0 mg PO qAM.
-Metolazone (Zaroxolyn) 2.5-10 mg PO qd, max 20 mg/d; 30 min before loop diuretic [2.5,5,10 mg].

**Digoxin:**

-Digoxin Maintenance - 0.125-0.5 mg PO or IV qd [0.125,0.25, 0.5 mg].

**Angiotensin- II Receptor Antagonist:**

-Losartan (Cozaar) 25-50 mg PO qd-bid, max 100 mg/day [25, 50 mg]; does not cause cough or angioedema.

**ACE Inhibitors:**

-Quinapril (Accupril) Initially 5-10 mg PO qd, then 20-80 mg PO qd in 1 to 2 divided doses [5,10,20,40 mg] **OR**
-Lisinopril (Zestril, Prinivil) 5-40 mg PO qd [5,10,20,40 mg] **OR**
-Benazepril (Lotensin) 10-40 mg PO qd, max 80 mg/d [5,10,20,40 mg] **OR**
-Fosinopril (Monopril) 10-40 mg PO qd, max 80 mg/d [10,20 mg] **OR**
-Ramipril (Altace) 2.5-10 mg PO qd, max 20 mg/d [1.25,2.5,5,10 mg].
-Captopril (Capoten) 6.25-50 mg PO q8h [12.5, 25,50,100 mg] **OR**
-Enalapril (Vasotec) 1.25-5 mg slow IV push q6h or 2.5-20 mg PO bid [5,10,20 mg] **OR**
-Moexipril (Univasc) initially 7.5 mg PO qd, then 7.5-15 mg PO qd-bid [7.5, 15 mg tabs].

**Inotropic Agents:**

-Dopamine 3-15 mcg/kg/min IV (400 mg in 250 cc D5W, 1600 mcg/mL), titrate to CO >4, CI >2; systolic > 90 **AND/OR**
-Dobutamine 2.5-10 mcg/kg/min, max of 14 mcg/kg/min (500 mg in 250 mL D5W, 2 mcg/mL) **AND/OR**
-Milrinone (Primacor) 50 mcg/kg IV over 10 min, followed by 0.375-0.75 (average 0.5) mcg/kg/min IV infusion (40 mg in 200 mLs NS (QS), conc=0.2 mg/mL).

**Nitrates:**

-Nitroglycerine 10 mcg/min IV (50 mg in 250-500 mL D5W) **OR**
-Isosorbide dinitrate (Isordil) 40 mg PO qid.

**Other Agents and Potassium:**

-KCL (Micro-K) 20-60 mEq PO qd.

10. **Symptomatic Medications:**
    -Heparin 5000 U SQ q12h.

-Docusate sodium 100-200 mg PO qhs.
-Ranitidine (Zantac)150 mg PO bid or 50 mg IV q8h.

**11. Extras:** CXR PA & LAT, ECG now & repeat if chest pain or palpitations, echocardiogram, radionuclide ventriculogram.

**12. Labs:** SMA 7 & 12, CBC; cardiac enzymes: CPK, CPK-MB, STAT & q6h x 24h. Repeat SMA 7 in AM. Digoxin level. UA.

**13. Other orders and meds:**

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## Paroxysmal Supraventricular Tachycardia

1. **Admit to:**
2. **Diagnosis:** PSVT
3. **Condition:**
4. **Vital signs:** q1h. Call physician if BP >160/90, <90/60; apical pulse >130, <50; R >25, <10; T >38.5°C
5. **Activity:** Bedrest with bedside commode.
6. **Nursing:**
7. **Diet:** Low fat, low cholesterol, no caffeine.
8. **IV Fluids:** D5W at TKO.

**9. Special Medications:**

Attempt vagal maneuvers (Valsalva maneuver and/or carotid sinus massage) before drug therapy (If no bruits).

**Cardioversion** (if unstable or refractory to drug therapy):

1. NPO x 6h, dig level ≤2.4 & potassium must be normal.
2. Midazolam (Versed) 2.5 mg IV.
3. If stable, cardiovert with synchronized 10-50 J, increase by 50 J increments. If unstable, start with 75-100 J, then increase to 200 J and 360 J.

**Pharmacologic Therapy of PSVT:**

-Adenosine (Adenocard) 6 mg rapid IV over 1-2 sec, followed by saline flush, may repeat 12 mg IV after 2-3 min, up to max of 30 mg total (ineffective if on theophylline) **OR**
-Verapamil (Isoptin) 2.5-10 mg IV over 2-3min (may give calcium gluconate 1 gm IV over 3-6 min prior to verapamil); then 40-120 mg PO q8h or verapamil SR 120-240 mg PO qd **OR**
-Esmolol hydrochloride (Brevibloc) 500 mcg/kg IV over 1 min, then 50 mcg/kg/min IV infusion titrated to HR of <60 (max of 300 mcg/kg/min) **OR**
-Diltiazem (Cardizem) 0.25 mg/kg (ave 20 mg) IV over 2 min, then 5-15 mg/hr IV infusion [100 mg/D5W 250 mLs (QS); conc 0.4 mg/mL]. For control of ventricular response rate only in atrial fibrillation/flutter.
-Propranolol 1-5 mg (0.15 mg/kg) given IV in 1 mg aliquots min; then 60-80 mg PO tid; propranolol-LA (Inderal-LA), 80-120 mg PO qd [60, 80, 120, 160 mg] **OR**
-Digoxin aliquots of 0.25 mg q4h as needed; then 0.125-0.25 mg PO or IV qd.

**10.Symptomatic Medications:**

-Lorazepam (Ativan) 1-2 mg PO tid prn anxiety.

**11.Extras:** Portable CXR, ECG; repeat if chest pain. Cardiology consult.

**12.Labs:** CBC, SMA 7 & 12, Mg, thyroid panel. Drug levels, toxicology screen, UA.

**13. Other Orders and Meds:**

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## Hypertensive Emergencies

1. **Admit to:**
2. **Diagnosis:** Emergencies Hypertension
3. **Condition:**
4. **Vital signs:** q30min until BP controlled, then q4h. Call physician if sudden change in BP >30 mmHg systolic; BP systolic >200, <90; diastolic >120, <60; P >120
5. **Activity:** bed rest
6. **Nursing:** Intra-arterial BP monitoring, daily weights, I&O.
7. **Diet:** Clear liquids.
8. **IV Fluids:** D5W at TKO.
9. **Special Medications:**
   -Nitroprusside sodium 0.25-10 mcg/kg/min IV (50 mg in 250 mL of D5W), titrate to desired BP. Discontinue if acute fall in BP >30 systolic **OR**
   -Labetalol (Trandate, Normodyne) 20 mg IV bolus (0.25 mg/kg), then 20-80 mg boluses IV q10-15min titrated to desired BP (max of 300 mg). Infusion of 1.0-2.0 mg/min **OR**
   -Clonidine (Catapres), initial 0.1-0.2 mg PO followed by 0.05-0.1 mg per hour until DBP <115 (max total dose of 0.8 mg); then 0.1-2.4 mg/d in divided doses bid-tid, max 2.4 mg/d. Clonidine patch (Catapres-TTS) 0.1-0.3 mg/24h apply q7 days [0.1,0.2,0.3 mg/24h] **OR**
   -Nifedipine (Procardia) 5-20 mg SL or PO (bite & swallow punctured capsule, 0.25-0.5 mg/kg/dose), repeat prn **OR**
   -Phentolamine (pheochromocytoma), 5-10 mg IV, repeated as needed up to 20 mg. Monoamine oxidase inhibitor with hypertensive crisis 5 mg slow IV push q4-6h (norepinephrine at bedside to treat hypotension). **OR**
   -Trimethaphan camsylate (Arfonad)(dissecting aneurysm) 2-4 mg/min IV infusion (500 mg in 500 mL D5W).
10. **Symptomatic Medications:**
11. **Extras:** Portable CXR, ECG, echocardiogram.
12. **Labs:** CBC, SMA 7, UA with micro. Thyroid stimulating hormone, free T4, 24h urine for metanephrine. Plasma catecholamines, urine drug screen.
13. **Other Orders and Meds:**

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## Syncope

1. **Admit to:**
2. **Diagnosis:** Syncope
3. **Condition:**
4. **Vital signs:** q1h, postural BP & pulse q12h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10
5. **Activity:** Bed rest.
6. **Nursing:** Fingerstick glucose.
7. **Diet:** Regular
8. **IV Fluids:** D5W at TKO.
9. **Special medications:**

**Vasovagal Syncope:**

-Scopolamine 1.5 mg transdermal patch q3 days.

**Postural Syncope:**

-Fludrocortisone 0.1-1 mg/d PO.

-Ibuprofen 200-800 mg PO qid.

**10. Extras:** CXR, ECG, signal averaged ECG, 24h Holter monitor, tilt test, EEG, echocardiogram, carotid duplex scan, CT/MRI.

**11. Labs:** CBC, SMA 7 & 12, CPK isoenzymes, Mg, Calcium. Blood alcohol, drug levels. UA, urine drug screen.

**12. Other Orders and Meds:**

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# Pulmonology

## Asthma

1. **Admit to:**
2. **Diagnosis:** Exacerbation of asthma
3. **Condition:**
4. **Vital signs:** q6h. Call physician if P >140; R >30, <10; T >38.5 C; pulse oximeter $O_2$ Sat <90%
5. **Activity:**
6. **Nursing:** Pulse oximeter, peak flow rate pre & post bronchodilator treatments, pulse oximeter. Avoid aspirin containing medications and sedatives. Measure bedside peak respiratory flow q2h with portable peak flowmeter.
7. **Diet:** Regular, no caffeine.
8. **IV Fluids:** D5 1/2 NS, at 125 cc/h.
9. **Special Medications:**
   -Oxygen 2-6 L/min by NC. Keep $O_2$ sat >90%.

**Beta Agonists, Acute Treatment:**

-Albuterol (Ventolin), 0.2-0.5 mL (2.5 mg) in 3 mL saline q2-8h prn (5 mg/mL sln) **OR**

-Albuterol (Ventolin) or Metaproterenol (Alupent) MDI 3-8 puffs, then 2 puffs q3-6h prn or powder 200 mcg/capsule inhaled qid prn.

**Systemic Corticosteroids:**

-Methylprednisolone (Solu-Medrol) 60-125 mg IV q6h; then 30-60 mg PO qd. **OR**

-Prednisone 20-60 mg PO qAM.

**Aminophylline and Theophylline (second-line therapy):**

-Aminophylline load dose: 5.6 mg/kg **total** body weight in 100 mL D5W IV over 20min. Maintenance of 0.5-0.6 mg/kg **ideal** body weight/h (500 mg in 250 mL D5W); reduce if elderly, heart/liver failure (0.2-0.4 mg/kg/hr); may need up to 0.8-0.9 mg/kg/h if smoker. Reduce load 50-75% if taking theophylline (1 mg/kg of aminophylline will raise levels 2 mcg/mL) **OR**

-Theophylline IV solution loading dose 4.5 mg/kg **total** body weight, then 0.4-0.5 mg/kg **ideal** body weight/hr.

-Theophylline (Theo-Dur) PO loading dose of 6 mg/kg, then maintenance of 100-400 mg PO bid-tid (3 mg/kg q8h); 80% of total daily IV aminophylline in 2-3 doses.

**Inhaled Corticosteroids (adjunct therapy):**

-Beclomethasone (Beclovent)(when off IV steroids) MDI 2-6 puffs qid, with spacer 5min after bronchodilator, followed by gargling with water **OR**

-Triamcinolone (Azmacort) MDI 1-4 puffs tid-qid **OR**

-Flunisolide (AeroBid) MDI 2-4 puffs bid **OR**

-Budesonide 200-800 mcg qid MDI (50 mcg/puff or 250 mcg/puff).

-After stabilization, inhaled corticosteroids should be the mainstay of treatment.

**Beta Agonists, Ipratropium, and Cromolyn:**

-Pirbuterol (Maxair) MDI 2 puffs q4-6h **OR**

-Bitolterol (Tornalate) MDI 2-3 puffs q1-3min initially, then 2-3 puffs q4-8h **OR**

-Fenoterol (Berotec) MDI 3 puffs initially, then 2 bid-qid.

-Salmeterol (Serevent) 2 puffs bid; should not be used for acute asthma because of delayed onset of action.

-Ipratropium Bromide (Atrovent) MDI 2-3 puffs tid-qid
-Cromolyn sodium (Intal) MDI 2 puffs qid.

**Acute Bronchitis**

-Ampicillin/sulbactam (Unasyn) 1.5 gm IV q6h **OR**
-Ampicillin 0.5-1 gm IV q6h or 250-500 mg PO qid **OR**
-Cefuroxime (Zinacef) 750 mg IV q8h **OR**
-Bactrim DS, 1 tab PO bid **OR**
-Amoxicillin/clavulanate (Augmentin) 250-500 mg PO q8h

**10. Symptomatic Medications:**

-Docusate sodium (Colace) 100-200 mg PO qhs.
-Ranitidine (Zantac) 50 mg IV q8h or 150 mg PO bid.

**11. Extras:** Portable CXR, ECG, pulmonary function tests pre and post bronchodilators; pulmonary rehabilitation, home peak flow measurement training.

**12. Labs:** ABG, CBC, SMA7. Theophylline level stat & after 24h of infusion. Sputum Gram stain, C&S.

**13. Other Orders and Meds:**

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## Chronic Obstructive Pulmonary Disease

1. **Admit to:**
2. **Diagnosis:** Exacerbation of COPD
3. **Condition:**
4. **Vital signs:** q4h. Call physician if P >130; R >30, <10; T >38.5 C; $O_2$ Sat <90%.
5. **Activity:** Bed rest, up in chair if able; bedside commode.
6. **Nursing:** Pulse oximeter. Measure peak flow with portable peak flowmeter bid and chart with vital signs. No sedatives.
7. **Diet:** No added salt, no caffeine. Push fluids.
8. **IV Fluids:** D5 1/2 NS with 20 mEq KCL/L at 125 cc/h.
9. **Special Medications:**

-$O_2$ 1-2 L/min by NC or 24-35% by Venturi mask, keep $O_2$ saturation 90-91%. (Monitor $PCO_2$ if chronic hypercapnia).

**Beta Agonists, Acute Treatment (mainstay of symptomatic therapy):**

-Nebulized Albuterol (Ventolin) 0.2-0.5 mL (2.5 mg) in 3 mL of saline q2-8h prn (5 mg/mL sln) **OR**
-Albuterol (Ventolin) or Metaproterenol (Alupent) MDI 2-4 puffs q4-6h prn.
-Salmeterol (Serevent) 2 puffs bid; should not be used for acute asthma because of delayed onset of action.

**Corticosteroids & Anticholinergics:**

-Methylprednisolone (Solu-Medrol) 60-125 mg IV q6h or 30-60 mg PO qd **Followed by:**
-Prednisone 20-60 mg PO qd, taper to minimum dose. Over 2 weeks if possible.
-Triamcinolone (Azmacort) MDI 2-4 puffs qid **OR**
-Beclomethasone (Beclovent) MDI 2-6 puffs qid, with spacer, 5 min after bronchodilator, followed by gargling with water **OR**
-Flunisolide (AeroBid) MDI 2-4 puffs bid **OR**
-Ipratropium Bromide (Atrovent) MDI 2 puffs tid-qid

**Aminophylline & Theophylline (second line therapy; useful in sympathetic assistant or nocturnal asthma):**

-Aminophylline loading dose - 5.6 mg/kg **total** body weight over 20 min (if not already on theophylline); then 0.5-0.6 mg/kg **ideal** body weight/hr (500 mg in 250 mL of D5W at 20 cc/h); reduce if elderly, or heart or liver disease (0.2-0.4 mg/kg/hr). Reduce loading to 50-75% if already taking theophylline (1 mg/kg of aminophylline will raise levels by 2 mcg/mL) **OR**

-Theophylline IV solution loading dose, 4.5 mg/kg **total** body weight, then 0.4-0.5 mg/kg **ideal** body weight/hr.

-Theophylline long acting (Theo-Dur) PO maintenance dose of 100-400 mg PO bid-tid (3 mg/kg q8h); 80% of daily IV aminophylline in 2-3 doses.

**Acute Bronchitis**

-Ampicillin 1 gm IV q6h or 250-500 mg PO qid **OR**

-Trimethoprim/Sulfamethoxazole (Septra DS) 160/800 mg PO bid or 160/800 mg IV q8-12h (10-15 mL in 100 cc D5W tid) **OR**

-Cefuroxime (Zinacef) 750 mg IV q8h **OR**

-Ampicillin/sulbactam (Unasyn) 1.5 gm IV q6h **OR**

-Cefuroxime (Zinacef) 1.5 gm IV q8h **OR**

-Doxycycline (Vibra-tabs) 100 mg PO bid.

**10. Symptomatic Medications:**

-Docusate sodium (Colace) 100-200 mg PO qhs.

-Ranitidine (Zantac)150 mg PO bid or 50 mg IV q8h.

**11. Extras:** Portable CXR, PFT's with bronchodilators, ECG.

**12. Labs:** ABG, CBC, SMA7. UA. Theo level stat & after 12-24h of infusion. Sputum Gram stain & C&S; alpha 1 antitrypsin level**.**

**13. Other Orders and Meds:**

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## Anaphylaxis

1. **Admit to:**
2. **Diagnosis:** Anaphylaxis
3. **Condition:**
4. **Vital signs:** q1-6h; Call physician if BP systolic >160, <90; diastolic >90, <60; P >120, <50; R>25, <10; T >38.5 C
5. **Activity:** Bedrest
6. **Nursing:** I&O q1-6h, $O_2$ at 6 L/min by NC or mask. Place patient in Trendelenburg's position, No. 4 or 5 endotracheal tube at bedside.
7. **Diet:** NPO
8. **IV Fluids:** 2 IV lines. Normal saline or LR 1-4 L over 1-3h, then D5 1/2 NS 150-200 cc/h. Foley to closed drainage.
9. **Special Medications:**

**Gastrointestinal Decontamination:**

-Gastric lavage if indicated for recent oral ingestion.

-Activated charcoal 50-100 gm, followed by cathartic.

**Bronchodilators:**

-Epinephrine (1:1000) 0.3-0.5 mL SQ or IM q10min or 1-4 mcg/min IV **OR** in severe life threatening reactions give 0.5 mg (5.0 mL of 1: 10,000 sln) IV q5-10min prn. **OR** dilute in 10 mL NS & give via endotracheal tube. Epinephrine, 0.3 mg of 1:1000 sln may be injected SQ at site of allergen injection **OR**

-Aerosolized 2% racemic epinephrine 0.5-0.75 mL **OR**
-Albuterol (Ventolin) 0.5%, 0.5 mL in 2.5 mL NS q30min by nebulizer prn.
-Aminophylline loading dose 5.6 mg/kg **total** body weight IV, then infuse 0.3-0.9 mg/kg **ideal** body weight/h **OR**
-Theophylline IV solution, loading dose 4.5 mg/kg **total** body weight, then 0.4-0.5 mg/kg **ideal** body weight/hr.

**Corticosteroids:**
-Methylprednisolone (Solu-Medrol) 50 mg IV q4-6h **OR**
-Methylprednisolone acetate (Depo-Medrol) 40-80 mg IM **OR**
-Hydrocortisone Sodium Succinate 200-500 mg IV q4-6h (IV steroids should be followed by PO steroids). (Consider 8-14 day taper).

**Antihistamines:**
-Diphenhydramine (Benadryl) 25-50 mg IV, IM or PO q2-4h **OR**
-Hydroxyzine (Vistaril) 25-50 mg IV, IM or PO q2-4h.
-Cimetidine (Tagamet) 300 mg IV or PO q6h **OR**
-Ranitidine (Zantac) 150 mg IV or PO bid.

**Pressors & other Agents:**
-Norepinephrine (Levophed) 8-12 mcg/min IV, adjust to systolic 100 mmHg (8 mg in 500 mL D5W) **OR**
-Isoproterenol (Isuprel) 0.5-5 mcg/min IV **OR**
-Dopamine (Intropin) 5-20 mcg/kg/min IV.

**10. Extras:** Portable CXR, ECG, allergy/immunology consult.

**11. Labs:** CBC, SMA 7&12; 24h urine for 5-hydroxyindoleacetic acid (carcinoid), UA.

**12. Other Orders and Meds:**

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## Pleural Effusion

1. **Admit to:**
2. **Diagnosis:** Pleural effusion
3. **Condition:**
4. **Vital signs:** q shift; Call physician if BP >160/90, <90/60; P>120, <50; R>25, <10; T >38.5 C
5. **Activity:**
6. **Diet:** Regular.
7. **IV Fluids:** D5W at TKO
8. **Extras:** CXR PA & LAT repeat after thoracentesis; bilateral lateral decubitus, ECG, ultrasound; PPD with control antigens (candida, mumps); pulmonary consult.

**9. Labs:** CBC, SMA 7 & 12, protein, albumin, amylase, rheumatoid factor, ANA, ESR, INR/PTT, UA. Fungal serologies, amebic titer.

**Pleural fluid**:
**Tube 1** - LDH, protein, amylase, triglyceride, glucose (10 mL).
**Tube 2** - Gram stain, C&S, AFB, fungal C&S (20-60 mL, heparinized).
**Tube 3** - Cell count and differential (5-10 mL, EDTA).
**Syringe** - pH (2 mL collected anaerobically, heparinized on ice)
**Bag or Bottle** - Cytology.

**10. Other Orders and Meds:**

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# Hematology

## Anticoagulant Overdose

**Heparin Overdose:**

1. Discontinue heparin infusion
2. Protamine sulfate, 1 mg IV for every 100 units of heparin infused in preceding 2h, dilute in 25-50 mL fluid IV over 10-20 min (max 50 mg in 10 min period). Watch for signs of anaphylaxis, especially if patient has been on NPH insulin therapy.

**Warfarin (Coumadin) Overdose:**

-Gastric lavage & activated charcoal if recent oral ingestion. Discontinue Coumadin and heparin and monitor hematocrit q2h.

**Minor Bleeds:**

-Vitamin K (Phytonadione), 5-10 mg PO or 2.5-5 mg SQ or 10 mg IV doses q12h, titrated to desired INR check INR q12h until stable.

**Serious Bleeds:**

-Vitamin K (Phytonadione), 10-20 mg in 50-100 mL fluid IV over 30-60 min (INR q6h until stable) **OR**

-Fresh frozen plasma, 2-3 units (severe bleeds).

**Labs:** CBC, check platelets (if <50,000, transfuse 4-6 U platelets), PTT, INR.

**Other orders and meds:**

_____

## Deep Vein Thrombosis

1. **Admit to:**
2. **Diagnosis:** Deep vein thrombosis
3. **Condition:**
4. **Vital signs:** q shift; Call physician if BP systolic >160, <90 diastolic. >90, <60; P >120, <50; R>25, <10; T >38.5 C.
5. **Activity:** Bed rest with legs elevated.
6. **Nursing:** Guaiac stools, warm packs to leg prn; keep leg elevated; measure calf circumference qd; no intramuscular injections or aspirin products.
7. **Diet:** Regular
8. **IV Fluids:** D5W at TKO
9. **Special Medications:**

**Anticoagulation:**

-Heparin IV bolus 5000-10,000 Units (100 U/kg) IVP, then 1000-1500 U/h IV infusion (20 U/kg/h; 15 U/kg/h if ≥ 80) [25,000 U in 500 ml D5W (50 U/ml)]. Check PTT 6 hours after initial bolus; adjust q6h until PTT 1.5-2 times control (50-70 sec). Discontinue heparin when INR in therapeutic range for two consecutive days.

-Warfarin (Coumadin) 5-10 mg PO qd x 2-3 d, then titrate based on rate of rise of INR; maintain INR 2.0-3.0 (INR 3.0-4.5 if recurrent thrombosis). May initiate Coumadin on second day of heparin if the PTT is in therapeutic range; discontinue heparin when INR is therapeutic for two consecutive days.

**10. Symptomatic Medications:**
-Propoxyphene/acetaminophen (Darvocet N100) 1-2 tab PO q3-4h prn pain
-Docusate sodium (Colace) 100-200 mg PO qhs.
-Ranitidine (Zantac) 150 mg PO bid.

**11. Extras:** CXR PA & LAT, ECG; impedance plethysmography & Doppler scan of legs, venography. V/Q scan. Contrast venogram (lower extremities).

**12. Labs:** CBC & INR/PTT, SMA 7. UA with dipstick for blood. PTT 6h after bolus & q4-6h until PTT 1.5-2.0 x control then qd. INR at initiation of warfarin & qd. Protein counterimmunoelectrophoresis, antithrombin III.

**13. Other Orders and Meds:**

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## Pulmonary Embolism

1. **Admit to:**
2. **Diagnosis:** Pulmonary embolism
3. **Condition:**
4. **Vital signs:** q1h x 12h, then qid; Call physician if BP >160/90, <90/60; P >120, <50; R >30, <10; T >38.5 C; $O_2$sat < 90%
5. **Activity:** Bedrest with bedside commode
6. **Nursing:** Pulse oximeter, guaiac stools, $O_2$ at 2-4 L by NC. No intramuscular injections; bed board, antiembolism stockings
7. **Diet:** Regular
8. **IV Fluids:** D5W at TKO.
9. **Special Medications:**

**Anticoagulation:**
-Heparin IV bolus 5000-10,000 Units (100 U/kg) IVP, then 1000-1500 U/h IV infusion (20 U/kg/h; 15 U/kg/h if ≥ 80) [25,000 U in 500 ml D5W (50 U/ml)]. Check PTT 6 hours after initial bolus; adjust q6h until PTT 1.5-2 times control (60-80 sec). Discontinue heparin when INR in therapeutic range for two consecutive days.
-Warfarin (Coumadin) 5 -10 mg PO qd x 2-3 d, then 2-5 mg PO qd based on rate of rise of INR. Maintain INR of 2.0-3.0 (INR 3.0-4.5 if recurrent pulmonary embolism). Check INR at initiation of warfarin & qd. May initiate Coumadin on second day of heparin if the PTT is in therapeutic range; discontinue heparin when INR is therapeutic for two consecutive days.

**Thrombolytics (symptoms <48 hours, positive angiogram, no contraindications. Indicated if hemodynamically compromised):**

**Baseline Labs:** CBC, PT/PTT, fibrinogen.

**Alteplase (Recombinant Tissue Plasminogen Activator, Activase):** 100 mg IV infusion over 2 hours, followed by heparin infusion at 15 U/kg/h (no loading dose) to maintain PTT 1.5-2.5 x control.

**OR**

**Streptokinase:** Pretreat with methylprednisolone 250 mg IVP and diphenhydramine (Benadryl) 50 mg IVP. Then give streptokinase, 250,000 units IV over 30 min, then 100,000 units/h for 24-72 hours. Initiate heparin infusion at 10 U/kg/hour (no loading dose); maintain PTT 1.5-2.5 x control.

**10. Symptomatic Medications:**
-Meperidine (Demerol) 25-100 mg IV prn pain.
-Docusate sodium (Colace) 100-200 mg PO qhs.

-Ranitidine (Zantac) 150 mg PO bid.

**11. Extras:** CXR PA & LAT, ECG, VQ scan; pulmonary angiography; impedance plethysmography of lower extremities, Doppler scan or contrast venogram of lower extremities.

**12. Labs:** CBC, INR/PTT, fibrinogen, SMA7, ABG, cardiac enzymes. UA with urine dipstick for blood. PTT 6 hours after bolus & q4-6h until PTT 1.5-2.5 x control, then. INR at initiation of warfarin & qd.

**13. Other Orders and Meds:**

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## Sickle Cell Crisis

1. **Admit to:**
2. **Diagnosis:** Sickle Cell Crisis
3. **Condition:**
4. **Vital signs:** q shift.
5. **Activity:** Bedrest
6. **Nursing:**
7. **Diet:** Regular diet, push oral fluids.
8. **IV Fluids:** D5 1/2 NS at 100-175 mL/h.
9. **Special Medications:**
   - -Oxygen 2-4 L/min by NC or 30-100% by mask.
   - -Meperidine (Demerol) 50-150 mg IM/IV/SC q4-6h.
   - -Hydroxyzine (Vistaril) 25-100 mg IM/IV/PO q3-4h prn pain.
   - -Morphine sulfate 10 mg IV/IM/SC q2-4h prn **OR** follow bolus by infusion of 0.05-0.1 mg/kg/h or 10-30 mg PO q4h **OR**
   - -Ketorolac (Toradol) 60 mg IM then 30 mg IM q6h (maximum of 5 days)
   - -Acetaminophen/codeine (Tylenol 3) 1-2 tabs PO q4-6h prn.
   - -Folic acid 1 mg PO qd.
   - -Penicillin V (prophylaxis), 250 mg PO bid [tabs 125,250,500 mg].
   - -Diazepam (Valium) 2-10 mg PO q8h prn muscle spasms.
   - -Prochlorperazine (Compazine) 5-10 mg PO on IM q6h prn nausea or vomiting.

**Vaccination (especially if splenectomized):**

- -Pneumovax (23V) before discharge 0.5 cc IM x 1 dose; once in a lifetime.
- -Influenza vaccine (Fluogen) 0.5 cc IM once a year.

**10. Extras:** CXR.

**11. Labs:** CBC, SMA 7, blood C&S, reticulocyte count, type & hold, parvovirus titers. UA, urine C&S.

**12. Other Orders and Meds:**

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# *Infectious Diseases*

## Empiric Therapy of Meningitis

1. **Admit to:**
2. **Diagnosis:** Meningitis.
3. **Condition:**
4. **Vital signs:** q1-6h; Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >39°C or less than 36°C
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Respiratory isolation. I&O, daily weights, lumbar puncture tray at bedside.
7. **Diet:**
8. **IV Fluids:** D5W at TKO
9. **Special Medications:**

**Meningitis Empiric Therapy 15-50 years old**

-Ampicillin 2 gm IV q4h (with 3rd gen cephalosporin) **AND EITHER**
Ceftriaxone (Rocephin) 2 gm IV q12h (max 4 gm/d) **OR**
Cefotaxime (Claforan) 2 gm IV q4h **OR**
-Severe penicillin allergy.
-Chloramphenicol 50 mg/kg/d IV **AND**
-Bactrim IV 8 mg/kg/d q6h.
-IV antibiotics x 10-14 days except in Listeria. Consider dexamethasone IV.

**Empiric Therapy >50 years old, Alcoholic, Corticosteroids or Hematologic malignancy or other Debilitating Condition:**

-Ampicillin 2 gm IV q4h **AND EITHER**
Cefotaxime (Claforan) 2 gm IV q4h **OR**
Ceftriaxone (Rocephin) 2 gm IV q12h (max 4 g/d) **OR**
Ceftizoxime (Cefizox) 2 gm IV q4h **OR**
Ceftazidime (Fortaz) 2 gm IV q4h **OR**
-Vancomycin 1 gm IVPB q12h
-Consider dexamethasone IV.

10. **Symptomatic Meds:**
    -Acetaminophen 325-650 mg PO/PR q4-6h prn temp >101.
11. **Extras:** CXR, ECG, PPD with controls, CT scan - if focal neurological signs after starting antibiotics..
12. **Labs:** CBC, SMA 7 & 12, osmolality. Blood C&S x 2. UA with micro, urine C&S. Stool, throat, nasal C&S. Antibiotic levels peak & trough after 3rd dose, VDRL.

**CSF Tube 1** - Gram stain of fluid (or of sediment if fluid is clear), C&S for bacteria (1-4 mL).
**CSF Tube 2** - Glucose, protein (1-2 mL).
**CSF Tube 3** - Cell count & differential (1-2 mL).
**CSF Tube 4** - Latex agglutination or counterimmunoelectrophoresis antigen tests for S. pneumoniae, H. influenzae (type B), N. meningitides, E. coli, group B strep, viral cultures, VDRL. India ink, fungal cultures, cryptococcal antigen, AFB (8-10 mL).

13. **Other Orders and Meds:**

# Infective Endocarditis

1. **Admit to:**
2. **Diagnosis:** Infective endocarditis
3. **Condition:**
4. **Vital signs:** q4h; Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >38.5 C
5. **Activity:** Up ad lib
6. **Diet:** Regular
7. **IV Fluids:** Hep-lock with flush q shift.
8. **Special Medications:**

**Subacute Bacterial Endocarditis Empiric Therapy:**

-Penicillin G 3-5 million U IV q4h or ampicillin 2 gm IV q4h **AND**
Gentamicin 80 mg (1-1.5/mg/kg) IV q8h

**Acute Bacterial Endocarditis Empiric Therapy**
(including IV drug abuser):

-Gentamicin 100-120 mg IV (2 mg/kg); then 80 mg (1-1.5 mg/kg) IV q8h **AND EITHER**
Nafcillin or Oxacillin 2 gm IV q4h **OR**
Vancomycin 1 gm IV q12h (1 gm in 250 mL D5W over 1h).

**Streptococci viridans/bovis:**

-Penicillin G 3-5 million U IV q4h for 4 weeks **OR**
-Vancomycin 1 gm IV q12h x 4 weeks **AND**
Gentamicin 70 mg (1 mg/kg) q8h for first 2 weeks.

**Enterococcus:**

-Gentamicin 70 mg (1 mg/kg) IV q8h x 4-6 weeks **AND EITHER**
-Penicillin G 3-5 million U IV q4h for 4-6 weeks **OR**
-Ampicillin 2 gms IV q4h for 4-6 weeks **OR**
-Vancomycin 1 gm IV q12h for 4-6 weeks.

**Staphylococcus aureus (methicillin sensitive, native valve):**

-Nafcillin or Oxacillin 2 gm IV q4h x 4-6 weeks **OR**
Vancomycin 1 gm IV q12h x 4-6 weeks **AND**
Gentamicin 70 mg (1 mg/kg) IV q8h for first 3-5 days.

**Methicillin resistant Staphylococcus aureus (native valve):**

-Vancomycin 1 gm IV q12h (1 gm in 250 mL D5W over 1h) x 4-6 weeks. ± Gentamycin 70 mg (1 mg/kg) IV q8h for 3-5 days.

**Methicillin resistant Staph aureus (prosthetic valve):**

-Vancomycin 1 gm IV q12h x 6 weeks **AND**
Rifampin 600 mg PO q8h x 6 weeks **AND**
Gentamicin 1 mg/kg IV q8h x 2 weeks.

**Staph epidermidis (prosthetic valve):**

-Vancomycin 1 gm IV q12h x 6 weeks **AND**
Rifampin 600 mg PO q8h x 6 weeks **AND**
Gentamicin 1 mg/kg IV q8h x 2 weeks.

**Culture Negative Endocarditis:**

-Penicillin G 3-5 million U IV q4h x 4-6 weeks **OR**
-Ampicillin 2 gm IV q4h x 4-6 weeks **AND**
Gentamicin 80 mg (1-1.5 mg/kg) q8h x 2 weeks (or use nafcillin and gentamicin if Staph aureus suspected in drug abuser or prosthetic valve).

**Fungal Endocarditis:**

-Amphotericin B 0.5 mg/kg/d IV (after test dose) + flucytosine 150 mg/kg/d PO.

**9. Extras:** CXR PA & LAT, echocardiogram, ECG.

**11. Labs:** CBC with differential, SMA 7 & 12. Blood C&S x 3-4 over 24h (if septic, draw over 1h before starting antibiotic), serum cidal titers, minimum inhibitory concentration, minimum bactericidal concentration. Repeat C&S in 48h, then q week. Antibiotic levels peak & trough at 3rd dose. UA, urine C&S.

**12. Other Orders and Meds:**

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## Empiric Therapy of Pneumonia

1. **Admit to:**
2. **Diagnosis:** Pneumonia
3. **Condition:**
4. **Vital signs:** q4-8h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5 C or $O_2$ saturation <90%.
5. **Activity:**
6. **Nursing:** Pulse oximeter, I&O, Nasotracheal suctioning prn, incentive spirometry.
7. **Diet:** Regular.
8. **IV Fluids:** IV D5 1/2 NS at 125 cc/hr or TKO.
9. **Special Medications:**
   -Oxygen by NC at 2-4 L/min, or 24-50% Ventimask, or 100% non-rebreather (reservoir) to maintain $O_2$ saturation >90%.

**Community Acquired Pneumonia 5-40 years old without underlying lung disease:**

-Cefuroxime 25 mg/kg IV q8h (children) or 0.75-1.5 gm IV q8h (adults) **OR**
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h **OR**
-Clarithromycin (Biaxin) 250-500 mg PO bid 7-10 days **OR**
-Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd x 4 days **OR**
-Erythromycin (Eramycin) 500 mg IV qid.

**Community Acquired Pneumonia >40 years old without underlying lung disease:**

-Erythromycin 500 mg IV q6h **AND/OR**
-Cefotaxime (Claforan) 1-2 gm IV q8 **OR**
-Ceftizoxime (Cefizox) 1-2 gm IV q8-12h **OR**
-Cefuroxime (Zinacef) 1.5 gm IV q8h **OR**
-Trimethoprim/Sulfamethoxazole (Septra DS) 6-10 mg TMP/kg/d IV in 2-3 divided doses **OR**
-Ampicillin/Sulbactam (Unasyn) 1.5 gm IV q6h. **OR**
-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q4-6h (200-300 mg/kg/d). **OR**
-Piperacillin/Tazobactam (Zosyn) 3.375 gm IV q6h. **OR**
Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h.

**Nosocomial, Hospital Acquired, Broad Spectrum Antibiotics Associated Pneumonia:**

-Tobramycin 80-100 mg IV q8h (3-5 mg/kg/d) **AND EITHER**
Ceftriaxone 1-2 gm IV q12-24h **OR**
Ceftizoxime (Cefizox) or other 3rd generation cephalosporin (see above) **OR**
Piperacillin or Ticarcillin 3 gm IV q4-6h (with tobramycin or gentamicin) **OR**
Piperacillin/Tazobactam (Zosyn) 3.375 gm IV q6h **OR**

Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h (monotherapy).

**Aspiration Pneumonia (community acquired):**

-Clindamycin (Cleocin) 600-900 mg IV q8h (with or without gentamicin or 3rd gen cephalosporin) **OR**

-Ampicillin/Sulbactam (Unasyn) 1.5-3 gm IV q6h (with or without gentamicin or 3rd gen cephalosporin) **OR**

-Ticarcillin/Clavulanic acid (Timentin) 3.1 gm IV q4-6h (with or without gentamicin)

**Aspiration Pneumonia (nosocomial):**

-Tobramycin 2 mg/kg IV then 1.7 mg/kg IV q8h **OR**

-Ceftazidime 1-2 gm IV q8h **AND EITHER**

Clindamycin (Cleocin) 600-900 mg IV q8h **OR**

Penicillin G 1-2 MU IV q4h **OR**

Ampicillin/Sulbactam or Ticarcillin/clavulanate, or Piperacillin/Tazobactam or Imipenem/cilastatin (see above).

**10. Symptomatic Medications:**

-Acetaminophen (Tylenol) 650 mg 2 tab PO q3-4h prn temp >101 or pain.

-Docusate sodium (Colace) 100-200 mg PO qhs.

-Ranitidine (Zantac) 150 mg PO bid.

**11. Extras:** CXR PA, LAT, ECG, PPD with control antigens (candida, mumps).

**12. Labs:** CBC with differential, SMA 7 & 12, ABG. Blood C&S x 2. Sputum gram stain, C&S. Methenamine silver sputum stain (PCP); AFB smear/culture; fungal prep (KOH). Aminoglycoside levels peak & trough at 3rd dose. UA, urine culture.

Cold agglutinins, titers for chlamydia pneumonia, mycoplasma, legionella

**13. Other Orders and Meds:**

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## Specific Therapy of Pneumonia

**Pneumococcal pneumoniae Pneumonia:**

-Penicillin G 1-2 million units IV q4h **OR**

-Erythromycin 500 mg IV q6h.

**Staphylococcus aureus Pneumonia:**

-Oxacillin or Nafcillin 2 gm IV q4h **OR**

-Vancomycin 1 gm IV q12h (1 gm in 250 cc D5W over 1h).

**Klebsiella pneumoniae Pneumonia:**

-Gentamicin 1.5-2 mg/kg IV, then 1.0-1.5 mg/kg IV q8h (adjust for Azotemia). **AND EITHER**

Ceftriaxone (Rocephin) 2 gm IV q12h **OR**

Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**

Ceftazidime (Fortaz) 1-2 gm IV q8h.

**Haemophilus influenzae:**

-Ampicillin 1-2 gm IV q6h (beta-lactamase negative) **OR**

-Cefuroxime 0.75-1.5 gm IV q8h (beta-lactamase pos) **OR**

-Ceftizoxime (Cefizox) 1-2 gm IV q8h **OR**

-Chloramphenicol 0.5-1.0 gm IV q6h.

**Pseudomonas aeruginosa:**

-Tobramycin 1.5-2.0 mg/kg IV, then 1.5-2.0 mg/kg IV q8h (adjust for Azotemia) **AND EITHER**

Piperacillin, Ticarcillin, Mezlocillin or Azlocillin 3 gm IV q4h **OR**

Ceftazidime 1-2 gm IV q8h.

**Mycoplasma pneumoniae:**
-Clarithromycin (Biaxin) 250-500 mg PO bid 7-10 days **OR**
-Azithromycin (Zithromax) 500 mg PO x 1, then 250 mg PO qd x 4 days **OR**
-Erythromycin 500 mg PO or IV q6h x 14-21 days.

**Legionella pneumoniae:**
-Erythromycin 1.0 gm IV q6h x 21 days **AND**
Rifampin 600 mg PO qd x 21 days.

**Moraxella (Branhamella) catarrhalis:**
-Ampicillin/sulbactam (Unasyn) 1.5-3 gm IV q6h **OR**
-Cefuroxime 0.75-1.5 gm IV q8h **OR**
-Erythromycin 0.5-1.0 gm IV q6h.

**Anaerobic Pneumonia:**
-Penicillin G 1-2 MU IV q4h **OR**
-Clindamycin (Cleocin) 600-900 mg IV q8h. **OR**
-Metronidazole (Flagyl) 500 mg IV q6-8h.

**13. Other Orders and Meds:**

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## Pneumocystis Carinii Pneumonia

1. **Admit to:**
2. **Diagnosis:** PCP pneumonia
3. **Condition:**
4. **Vital signs:** q2-6h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; 02 sat <90%
5. **Activity:**
6. **Nursing:** Pulse oximeter.
7. **Diet:** Regular, encourage fluids.
8. **IV Fluids:** D5 1/2 NS at 50-100 cc/h or TKO.
9. **Special Medications:**

**Pneumocystis Carinii Pneumonia:**
-Trimethoprim/sulfamethoxazole (Bactrim, Septra) 15 mg/kg/day (based on TMP) PO or IV in 3-4 divided doses x 21 days; drug of choice
-If moderately severe PCP (Pa02 <70 mm Hg): Give methylprednisolone 40 mg IV q8h or prednisone 40 mg PO bid for 5 days. Taper dose to one-half this amount for the next 5 days; then 20 mg qd for an additional 11 days, for a total of 21 days.
-Pentamidine (Pentam) 3-4 mg/kg IV qd x 21 days, with methylprednisolone as above. Pentamidine is an alternate treatment if inadequate response to TMP-SMX.
-Atovaquone (Mepron) 750 mg PO tid x 21 days. Use restricted to those with mild to moderate PCP who are refractory to or intolerant of TMP-SMX.

**PCP prophylaxis** (previous PCP or CD4 <200, or constitutional symptoms):
-TMP/SMX DS (160/800 mg) PO qd **OR**
-Pentamidine, 300 mg in 6 mL sterile water via Respirgard II nebulizer over 20-30 min q4 weeks; may pretreat with Albuterol 2.5 mg in 5 mL NS **OR**
-Dapsone (DDS) 50 mg PO qd, given 2-7 days per week, contraindicated in G-6-PD deficiency.

**Antiviral Therapy:**

-Zidovudine (Retrovir)(CD4 <500, symptomatic AIDS)100 mg PO q4 hours or 100 mg five times a day; some physicians prescribe 200 mg tid. Dosage may be reduced to 100 mg tid if significant anemia [100-mg caps] **OR**

-Didanosine (DDI, Videx) 200 mg PO bid for patients >60 kg; or 100 mg PO bid for patients <60 kg [100-mg, 150-mg buffered tablet may be mixed with water and taken on an empty stomach] **OR**

-Zalcitabine (DDC, Hivid) 0.375-0.75 mg PO q8h [0.375, 0.75 mg].

-Hold antiviral therapy during TMP/SMX therapy because of the marrow suppressing side effects of both drugs combined

-**Post-exposure Prophylaxis**: Zidovudine, 200 mg PO q4h x 72h, then 200 mg 5 times/day x 25 days.

**Zidovudine-Induced Neutropenia/Ganciclovir-Induced Leukopenia**

-Recombinant human granulocyte colony-stimulating factor (G-CSF, Filgrastim, Neupogen) 1-2 mcg/kg SQ qd until absolute neutrophil count 500-1000; indicated only if the patient's endogenous erythropoietin level is low.

**10. Other Medications:**

-Ranitidine (Zantac) 150 mg PO bid.

**11. Extras:** CXR PA & LAT.

**12. Labs:** ABG, CBC, SMA 7 & 12. Blood C&S x 2. Sputum for Gram stain, C&S, AFB. Giemsa immunofluorescence for Pneumocystis, fungal C&S. Induce sputum with nebulized 3% saline after gargling with 3% saline.
CD4 count, VDRL, serum cryptococcal antigen, HBsAg, anti-HBs, toxoplasmosis titer. UA.

**Bronchoscopic Considerations:** Consider bronchoscopy if sputum non-diagnostic or CXR is atypical for PCP or if patient not responding to empiric PCP therapy.

## Opportunistic Infections in HIV Infected Patients

**Oral Candidiasis**:

-Fluconazole (Diflucan) Acute: 100-200 mg po qd; higher dosages might be necessary. Maintenance: 100-200 mg po once weekly or 50-100 mg po qd **OR**

-Ketoconazole (Nizoral), acute: 400 mg po qd 1-2 weeks or until resolved. Maintenance: 200 mg po qd-bid for 7 consecutive days per month or qd if necessary. **OR**

-Clotrimazole (Mycelex) troches 10 mg dissolved slowly in mouth 5 times/d **OR**

-Nystatin (Mycostatin) 100,000 U/mL, swish and swallow 5 mL po q 6 hr or one 500,000-unit tablet dissolved slowly in mouth q6h **OR**

-Itraconazole (Sporanox) 200 mg PO qd x 2 weeks

**Candida Esophagitis**:

-Fluconazole 200-400 mg po qd x 14-21 days; higher dosages might be required **OR**

-Ketoconazole 200 mg po bid.

-Itraconazole (Sporanox) 200 mg PO qd x 2 weeks.

-Maintenance with fluconazole (100 mg po qd) or ketoconazole (200 mg PO qd) may be required at the lowest effective dose.

**Primary or Recurrent Mucocutaneous HSV**

-Acyclovir (Zovirax), 200-400 mg po 5 times a day for 10 days, or 5 mg/kg IV q8h OR In cases of acyclovir resistance, foscarnet, 40 mg/kg IV q8h, via infusion pump only, for 21 days.

-Prophylaxis: Acyclovir (Zovirax) 400 mg PO bid.

**Herpes Simplex Encephalitis (or visceral disease):**

-Acyclovir 10 mg/kg IV q8h x 10-21 days.

**Herpes Varicella Zoster**

-Acyclovir 10 mg/kg IV over 60 min q8h for 7-14 days **OR** 800 mg PO 5 times/d x 7-10 days **OR**

-Foscarnet 40 mg/kg IV q8h.

**Cytomegalovirus Infections:**

-Ganciclovir (Cytovene) 5 mg/kg IV (dilute in 100 mLs D5W over 60 min) q12h x 14-21 days for retinitis, colitis, esophagitis (concurrent use with zidovudine may increase hematological toxicity)

**Suppressive Treatment for CMV:**

-Ganciclovir 5 mg/kg IV qd, or 6 mg/kg 5 times/wk.

**Toxoplasmosis:**

-Clindamycin 600-900 mg po or IV qid plus pyrimethamine 25-75 mg po qd-qOD plus leucovorin calcium (folinic acid) 10-25 mg po qd for 6-8 weeks for acute therapy; lifetime suppression with highest tolerated dosage **OR**

-Azithromycin (Zithromax) 1,800 mg PO first dose then 1,200 mg/day PO x 6 weeks.

**Suppressive Treatment for Toxoplasmosis:**

-Pyrimethamine 25-50 mg PO qd with or without sulfadiazine 0.5-1.0 Gm PO q6h; and folinic acid 5-10 mg PO qd.

-Pyrimethamine 50 mg PO qd; and clindamycin 300 mg PO q6h; and folinic acid 5-10 mg PO qd.

**Cryptococcus Neoformans Meningitis:**

-Amphotericin B 0.7-1.0 mg/kg/d IV; amphotericin total dosage not to exceed 2 g, with or without 5-flucytosine 100 mg/kg po qd in at divided doses for first 2-4 weeks or until clinically improved, followed by fluconazole 400 mg po qd or itraconazole 200 mg po bid 6-8 weeks

**OR**

-Fluconazole 400-800 mg po qd for 8-12 weeks

**Suppressive Treatment for Cryptococcus:**

-Fluconazole (Diflucan) 200 mg PO qd indefinitely **OR**

-Itraconazole (Sporanox) 200 mg PO qd-bid indefinitely.

**Active Tuberculosis:**

-Isoniazid (INH) 300 mg PO qd; and rifampin 600 mg PO qd; and pyrazinamide 15-25 mg/kg PO qd; and ethambutol 15-25 mg/kg PO qd; or streptomycin 15 mg/kg IM qd, or 20 mg/kg IM twice/wk.

-Pyridoxine (Vitamin B6) 50 mg PO qd concurrent with INH.

-All four drugs are continued for 2 months; isoniazid and rifampin (depending on susceptibility testing) are continued for a period of at least 9 months and at least 6 months after the last negative cultures.

**Prophylaxis for Inactive Tuberculosis:**

-Isoniazid 300 mg PO qd; and pyridoxine 50 mg PO qd x 12 months.

**Disseminated Mycobacterium Avium Complex (MAC):**

-Clarithromycin (Biaxin) 500-1000 mg PO bid; or Azithromycin (Zithromax) 500 mg PO qd; **AND EITHER**

Ethambutol 15-25 mg/kg PO qd, **OR**

Clofazimine (Lamprene) 100-200 mg PO qd, **OR**

Ciprofloxacin (Cipro) 750 mg PO bid or 400 mg IV bid.

**Prophylaxis for MAC:**

-Clarithromycin (Biaxin), 500 mg BID or azithromycin (Zithromax) 500-1000 mg/d are the preferred first agents.

-Rifabutin (Mycobutin), 300 mg PO qd or 150 mg PO bid.

**Disseminated Coccidioidomycosis:**

-Amphotericin B 0.5-0.8 mg/kg IV qd, until total dose 2.0-2.5 gms. **OR**

-Fluconazole (Diflucan) 400-800 mg PO and/or IV qd.

**Disseminated Histoplasmosis:**

-Amphotericin B 0.5-0.8 mg/kg IV qd, until total dose 15 mg/kg. **OR**

-Fluconazole 400 mg PO qd. **OR**

-Itraconazole (Sporanox) 300 mg PO bid x 3 days, then 200 mg PO bid.

-AIDS associated diarrhea, see page 40.

**Suppressive Treatment for Histoplasmosis:**

-Fluconazole (Diflucan) 400 mg PO qd **OR**

-Itraconazole (Sporanox) 200 mg PO bid.

## Septic Shock

1. **Admit to:**
2. **Diagnosis:** Sepsis
3. **Condition:**
4. **Vital signs:** q1h; Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >38.5 C; urine output < 25 cc/hr for 4h 02 saturation <90%.
5. **Activity:** Bed rest.
6. **Nursing:** I&O, pulse oximeter. Foley catheter to closed drainage.
7. **Diet:** NPO
8. **IV Fluids:** 2 liters of normal saline over 2 hours, then D5 1/2 NS at 125 cc/h
9. **Special Medications:**

-Oxygen at 2-5 L/min by NC or mask.

**Antibiotic Therapy**

**a.** For initial treatment of life-threatening sepsis in adults, a third-generation cephalosporin (cefotaxime, ceftizoxime or ceftriaxone), ticarcillin/clavulanic acid or imipenem, each with an aminoglycoside (gentamicin, tobramycin or amikacin) is recommended.

**b. For intra-abdominal or pelvic infections** likely to involve anaerobes, treatment should include either ticarcillin/clavulanic acid, ampicillin/sulbactam, piperacillin/tazobactam, imipenem, cefoxitin or cefotetan, each with an aminoglycoside or, alternatively, metronidazole or clindamycin, together with an aminoglycoside.

**c. Dosages for Antibiotics Used in Sepsis**

-Cefotaxime (Claforan) 2 gm q4-6h.

-Ceftizoxime (Cefizox) 1-2 gm IV q8h.

-Ceftriaxone (Rocephin) 1-2 gm IV q12h (max 4 gm/d).

-Cefoxitin (Mefoxin) 1-2 gms q6-8h.

-Cefotetan (Cefotan) 1-2 gms IV q12h.

-Ceftazidime (Fortaz) 1-2 g IV q8h.

-Ticarcillin/clavulanate (Timentin) 3.1 gm IV q4-6h (200-300 mg/kg/d).

-Ampicillin/Sulbactam (Unasyn) 1.5-3.0 gm IV q6h.

-Piperacillin/tazobactam (Zosyn) 3.375-4.5 gm IV q6h.

-Piperacillin, ticarcillin, mezlocillin 3 gms IV q4-6h.

-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h (with gentamicin/tobramycin).
-Gentamicin, tobramycin 5 mg/kg IV qd; or 100-120 mg (1.5-2 mg/kg) IV, then 80 mg IV q8h (3-5 mg/kg/d).
-Amikacin (Amikin) 5.0 mg/kg IV loading dose; then 5 mg/kg IV q8h.
-Vancomycin 500 mg IV q6h, or 1 gm IV q12h.
-Ciprofloxacin (Cipro) 400 mg IV q12h.
-Aztreonam (Azactam) 1-2 gm IV q6-8h; max 8 g/day.
-Metronidazole 500 mg (7.5 mg/kg) IV q6h.
-Clindamycin 600-900 IV q8h (15-30 mg/kg/d).

**Nosocomial sepsis with IV catheter or IV drug abuse**

-Vancomycin 1 gm q12h (1 gm in 250 cc D5W over 60 min); **AND**
Gentamicin or Tobramycin as above; **AND EITHER**
Ceftazidime or Ceftizoxime 1-2 gms IV q8h **OR**
Piperacillin, ticarcillin or mezlocillin 3 gm IV q4-6h.

**Blood Pressure Support**

-Dopamine 4-20 mcg/kg/min (200 mg in 250 cc D5W, 800 mcg/mL).
-Albumin 25 gm IV (100 mL of 25% sln) **OR**
-Hetastarch (Hespan) 500-1000 cc over 30-60 min (max 1500 cc/d).
-Dobutamine 5 mcg/kg/min, and titrate up to max 15 mcg/kg/min.

**10. Symptomatic Medications:**

-Acetaminophen 650 mg PR/PO q4-6h prn temp >101.
-Ranitidine (Zantac) 50 mg IV q8h or 150 mg PO bid.

**11. Extras:** CXR, KUB, sinus films, ECG. Indium/Gallium scan, ultrasound, lumbar puncture. Cardiology, critical care consult.

**12. Labs:** CBC with differential, SMA 7 & 12, blood C&S x 3, T&C for 3-6 Units PRBC, INR/PTT, drugs levels peak & trough at 3rd dose. UA. Cultures of urine, sputum, wound, IV catheters, ascitic fluid, decubitus ulcers, pleural fluid.

## Peritonitis

1. **Admit to:**
2. **Diagnosis:** Peritonitis
3. **Condition:**
4. **Vital signs:** q1-6h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5 C.
5. **Activity:** Bed rest.
6. **Nursing:** Guaiac stools.
7. **Diet:** NPO
8. **IV Fluids:** D5 1/2 NS at 125 cc/h
9. **Special Medications:**

**Spontaneous Bacterial Peritonitis (nephrotic or cirrhotic):**

**Option 1:**

-Ampicillin 1-2 gms IV q 4-6h; (vancomycin 500 mg IV q6h or 1 gm IV q12h if penicillin allergic) **AND EITHER**
Cefotaxime (Claforan) 1-2 gm IV q4-6h **OR**
Ceftizoxime (Cefizox) 1-2 gms IV q8h **OR**
Gentamicin or Tobramycin 1.5 mg/kg IV, then 1 mg/kg q8h (adjust for renal function).

**Option 2:**

-Ticarcillin/clavulanate (Timentin) 3.1 gms IV q6h.

**Option 3:**
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6h.

**Secondary Bacterial Peritonitis:**

**Option 1:**
-Ampicillin 1-2 gm IV q4-6h **AND**
Gentamicin or tobramycin (aminoglycosides are not recommended in patients with cirrhosis) 100-120 mg (1.5 mg/kg); then 80 mg IV q8h (5 mg/kg/d)(if resistant, use amikacin) **AND**
Metronidazole 500 mg IV q6h (15-30 mg/kg/d) **OR**
Cefoxitin 1-2 gm IV q6h **OR**
Cefotetan 1-2 gm IV q12h.

**Option 2:**
-Ticarcillin/clavulanic acid (Timentin) 3.1 gm IV q4-6h (200-300 mg/kg/d) with aminoglycoside as above.

**Option 3:**
-Ampicillin/sulbactam (Unasyn) 1.5-3.0 gm IV q6h with aminoglycoside as above.

**Option 4:**
-Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h.

**Fungal:**
-Amphotericin B (2 mg/L 1st 24 hours then 1.5 mg/L) **OR**
-Fluconazole (Diflucan) 200 mg PO x 1, then 100 mg PO qd **AND**
Flucytosine 2 gm PO x 1, then 1 gm PO qd.

**10. Symptomatic Meds:**
-Ranitidine (Zantac) 50 mg IV q8h or 150 mg PO bid.
-Acetaminophen 325 mg PO/PR q4-6h prn temp >101.

**11. Extras:** Plain film, upright abdomen, lateral decubitus, CXR PA & LAT; stat surgery consult for secondary bacterial peritonitis; ECG, abdominal ultrasound. CT scan.

**12. Labs:** CBC with differential, SMA 7 & 12, amylase, lactate. INR/PTT, UA with micro, C&S; drugs levels peak & trough 3rd dose.

**Paracentesis TUBE 1** - Cell count & differential (1-2 mL, EDTA purple top tube)

**TUBE 2** - Gram stain of sediment; inject 10-20 mL into anaerobic & aerobic culture bottle; AFB, fungal C&S (3-4 mL).

**TUBE 3** - Glucose, protein, albumin, LDH, triglycerides, specific gravity, bilirubin, amylase (2-3 mL, red top tube).

**SYRINGE** - pH, lactate (3 mL).

**13. Other Orders and Meds:**

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## Diverticulitis

1. **Admit to:**
2. **Diagnosis:** Diverticulitis
3. **Condition:**
4. **Vital signs:** qid; Call physician if BP systolic >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. **Activity:** Up ad lib in room.
6. **Nursing:** Daily weights, I&O. Guaiac all stools.
7. **Diet:** NPO. Advance to clear liquids in morning as tolerated.

8. **IV Fluids:** 0.5-2 L NS over 1-2 hr then, D5 1/2 NS at 125 cc/hr. NG tube at lo
intermittent suction (if obstructed).
9. **Special Medications:**

**Regimen 1:**

-Gentamicin or tobramycin 100-120 mg IV (1.5-2 mg/kg), then 80 mg IV tid (5 mg/kg/d) **AND EITHER**
Cefoxitin (Mefoxin) 2 gm IV q6-8h **OR**
Clindamycin (Cleocin) 600-900 mg IV q8h.

**Regimen 2:**

-Metronidazole 1 g (15 mg/kg) IV then 500 mg q6-8h (15-30 mg/kg/d) **AND**
Ciprofloxacin (Cipro) 250-500 mg PO bid or 200-300 mg IV q12h

**Outpatient Regimen:**

-Trimethoprim/SMX (Bactrim DS) 1 double strength tab PO bid **AND**
metronidazole 250-500 mg PO q6h **OR**
-Ciprofloxacin (Cipro) 250-500 mg PO bid.

10. **Symptomatic Medications:**
-Ranitidine (Zantac) 50 mg IV q8h or 150 mg PO bid.
-Meperidine 50-100 mg IM or IV q3-4h prn pain.
-Zolpidem (Ambien) 5-10 mg qhs, use 5 mg for elderly
11. **Extras:** Acute abdomen series, CXR PA & LAT, ECG, CT scan of abdomen, ultrasound, surgery and GI consults.
12. **Labs:** CBC with differential, SMA 7 & 12, amylase, lipase, blood cultures x 2, drug levels peak & trough 3rd dose. UA, C&S. Dipstick urine for blood.
13. **Other Orders and Meds:**

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## Active Pulmonary Tuberculosis

1. **Admit to:**
2. **Diagnosis:** Active Pulmonary Tuberculosis
3. **Condition:**
4. **Vital signs:** q shift
5. **Activity:** Up ad lib in room.
6. **Nursing:** Respiratory isolation for 1-2 weeks after starting treatment.
7. **Diet:** Regular
8. **Special Medications:**
-Isoniazid 300 mg PO qd (5 mg/kg/d, max 300 mg/d) for 6 months **AND**
Rifampin 600 mg PO qd (10 mg/kg/d, 600 mg/d max) for 6 months **AND**
Pyrazinamide 1.5-2.5 gm (15-30 mg/kg/d, max 2.5 gm) PO qd in 3 divided doses for 6 months
-If resistance to INH is likely, add Ethambutol 1.5 gm (25 mg/kg/d, 2.5 gm/d max) PO qd
-The regimen of isoniazid, rifampin, and pyrazinamide for 2 months, then isoniazid and rifampin for 4 months is also effective if a resistant organism is not suspected.

**Prophylaxis**

-Isoniazid 300 mg PO qd (5 mg/kg/d) x 6 months (12 months if HIV positive).

9. **Extras:** CXR PA, LAT, ECG.
10. **Labs:** CBC with differential, SMA7 & 12, LFT's, HIV serology. First AM sputum for AFB x 3 samples. UA with micro, C&S.

# Cellulitis

1. **Admit to:**
2. **Diagnosis:** Cellulitis
3. **Condition:**
4. **Vital signs:** tid; Call physician if BP <90/60; T >38.5°C
5. **Activity:** Up ad lib.
6. **Nursing:** Keep affected extremity elevated; warm compresses prn.
7. **Diet:** Regular, encourage fluids.
8. **IV Fluids:** Hep lock with flush q shift.
9. **Special Medications:**

**Empiric Therapy Cellulitis**

-Nafcillin or Oxacillin 1-2 gm IV q4-6h **OR**
-Cefazolin (Ancef) 1-2 gm IV q8h **OR**
-Vancomycin 1 gm q12h (1 gm in 250 cc D5W over 1h) **OR**
-Erythromycin 500 IV/PO q6h **OR**
-Dicloxacillin 250-500 mg PO qid (in mild disease or after improvement on IV therapy); may add penicillin VK to enhance coverage for streptococcus.

**Immunosuppressed, Diabetic Patients, or Ulcerated Lesions:**

-Use nafcillin or cefazolin + (gentamicin or aztreonam + clindamycin or metronidazole if septic) **OR** Timentin **OR** Imipenem **OR** Cipro + clindamycin or metronidazole.
-Nafcillin or oxacillin 1-2 gm IV q4-6h.
-Cefazolin (Ancef) 1-2 gm IV q8h.
-Cefoxitin (Mefoxin) 1-2 gm IV q6-8h.
**If Septic:** Add gentamicin 100-120 mg IV (1.5-3 mg/kg), then 80 mg IV q8h (3-5 mg/kg/d) **OR** Aztreonam (Azactam) 1-2 gm IV q6-8h **PLUS**
-Clindamycin (Cleocin) 600-900 mg IV q8h or 450 mg PO qid **OR**
-Metronidazole (Flagyl) 500 mg IV/PO q6h.
-Ticarcillin/clavulanic acid (Timentin) **(single drug Tx)** 3.1 gm IV q4-6h (200-300 mg/kg/d).
-Ampicillin/Sulbactam (Unasyn) **(single drug therapy)** 1.5-3.0 gm IV q6h.
-Imipenem/cilastatin (Primaxin) **(single drug therapy)** 0.5-1 mg IV q6-8h **OR**
-Ciprofloxacin (Cipro) 250-500 mg PO bid or 200-300 mg IV q12h **AND**
Clindamycin 250-500 mg PO bid or 600-900 mg IV q8h (or metronidazole).

10. **Symptomatic Medications:**

-Silver sulfadiazine or ½ strength Dakin's sln wet to dry dressings tid. 1:1000 Betadine soaks qd.
-Acetaminophen/codeine (Tylenol #3) PO q4h prn pain.

11. **Extras:** Technetium/Gallium scans, Doppler analysis (ankle-brachial indices), impedance plethysmography.
12. **Labs:** CBC, SMA 7, blood C&S x 2. Leading edge aspirate, swab, drainage fluid for Gram stain, C&S; UA, antibiotic levels.

# *Gastroenterology*

## Peptic Ulcer Disease

1. **Admit to:**
2. **Diagnosis:** Peptic ulcer disease.
3. **Condition:**
4. **Vital Signs:** qid, postural BP; Call physician if BP systolic >160, <90; diastolic. >90, <60; P >120, <50; T >38.5°C
5. **Activity:** Up ad lib
6. **Nursing:** Guaiac all stools.
7. **Diet:** NPO 48h, then regular, no caffeine.
8. **IV Fluids:** D5 1/2 NS with 20 mEq KCL at 125 cc/h. NG tube at low intermitte suction (if obstructed).
9. **Special Medications:**
   -Ranitidine (Zantac) 50 mg IV bolus, then continuous infusion at 6.25-12.5 mg/h (150-300 mg in 500 mL D5W at 21 mL/h over 24h) or 50 mg IV q8h, or 150 mg PO bid or 300 mg PO qhs **OR**
   -Cimetidine (Tagamet) 300 mg IV bolus, then continuous infusion at 37.5-50 mg/h (900 mg in 500 mL D5W over 24h) or 300 mg IV q6-8h, or 400 mg PO bid or 800 mg PO qhs **OR**
   -Famotidine (Pepcid) 20 mg IV q12h or 20 mg PO bid or 40 mg PO qhs **OR**
   -Nizatidine (Axid) 300 mg PO qhs or 150 mg PO bid **OR**
   -Omeprazole (Prilosec) 20 mg PO bid (30 minutes prior to meals) **OR**
   -Lansoprazole (Prevacid) 15-30 mg PO qd prior to breakfast [15, 30 mg caps].

**Eradication of H pylori:**

**Option 1:**
-Bismuth subsalicylate (Pepto-Bismol) 2 tabs or 30 mLs PO qid **and** metronidazole (Flagyl) 250 mg PO qid **and** tetracycline 500 mg qid. Treat for 14 days.

**Option 2:**
-Bismuth subsalicylate (Pepto-Bismol) 2 tabs or 30 mLs PO qid **and** metronidazole (Flagyl) 250 mg PO qid **and** amoxicillin 500 mg qid. Treat for 14 days.

**Option 3:**
-Bismuth subsalicylate (Pepto-Bismol) 2 tabs or 30 mLs PO qid **and** clarithromycin (Biaxin) 250-500 mg PO bid **and** amoxicillin 500 mg qid. Treat for 14 days.

10. **Symptomatic Medications:**
    -Trimethobenzamide (Tigan) 100-250 mg PO or 100-200 mg IM/PR q6h prn nausea **OR**
    -Prochlorperazine (Compazine) 5-10 mg IM/IV/PO q4-6h, or 25 mg PR q4-6h prn nausea.
    -Meperidine (Demerol) 50-100 mg IM/IV q3-4h prn pain

**11. Extras:** Upright abdomen, KUB, CXR, ECG, endoscopy. GI consult. Surgery consult.

**12. Labs:** CBC, SMA 7 & 12, amylase, lipase, LDH. UA, Helicobacter pylori IgG, Salicylate level. Fasting serum gastrin qAM x 3 day (hypersecretory syndrome)

# Gastrointestinal Bleeding

1. **Admit to:**
2. **Diagnosis:** Upper/lower GI bleed
3. **Condition:**
4. **Vital signs:** q30min; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; urine output <15 mL/hr for 4h.
5. **Activity:** Bed rest
6. **Nursing:** Place nasogastric tube, then lavage with 2 L of room temperature normal saline, then connect to low intermittent suction, repeat lavage q1h. Record volume & character of lavage. Remove NG tube when there is no evidence of continued bleeding. Foley to closed drainage; I&O. Record stool character.
7. **Diet:** NPO
8. **IV Fluids:** Two 16 gauge IV lines. 3 L NS over 1-4h; when available, transfuse 2-6 units PRBC run as fast as possible, then call physician for further orders.
9. **Special Medications:**
   -Oxygen 2 L by NC.
   -Ranitidine (Zantac) 50 mg IV bolus, then continuous infusion at 6.25-12.5 mg/h [150-300 mg in 500 mL D5W over 24h (21 cc/h)], or 50 mg IV q6-8h **OR**
   -Cimetidine (Tagamet) 300 mg IV bolus, then continuous infusion at 37.5-50 mg/h (900 mg in 500 cc D5W over 24h), or 300 mg IV q6-8h **OR**
   -Famotidine (Pepcid) 20 mg IV q12h.

**Suspected Esophageal Variceal Bleeds:**

**Option 1:**
   -Vasopressin (Pitressin) 20 U IV over 20-30 minutes, then 0.2-0.3 U/min [100 U in 250 mL of D5W (0.4 U/mL)], for 30 min, followed by increases of 0.2 U/min until bleeding stops or max of 0.9 U/min. If bleeding stops, taper over 24-48h **AND**
   -Nitropaste (with vasopressin) 1 inch q6h **OR** nitroglycerin IV at 10-30 mcg/min continuous infusion (50 mg in 250 mLs D5W).

**Option 2:**
   -Somatostatin (Octreotide) 50 mcg IV bolus followed by 25-50 mcg/h IV infusion.
   -Vitamin K (Phytonadione) 10 mg IV/SQ qd for 3 days (only if INR is elevated).
   -Fresh frozen plasma 2-4 U IV (for severe coagulopathies or after transfusion of 6 U PRBC).

10. **Extras:** Potable CXR, upright abdomen, ECG. Surgery & GI consults.

**Upper GI Bleeds:** Esophagogastroduodenoscopy with possible coagulation or sclerotherapy; Sengstaken-Blakemore or Minnesota tube for tamponade for esophageal varices.

**Lower GI Bleeds:** Sigmoidoscopy/colonoscopy (after a GoLytely purge 6-8 L over 4-6h), technetium 99m RBC scan, angiography with possible embolization.

11. **Labs:** Repeat spun hematocrit q2h with CBC with platelets q12-24h. Repeat PT in 6 hours. SMA 7 & 12, ALT, AST, alkaline phosphatase, salicylate level, INR/PTT, type and cross for 3-6 U PRBC & 2-4 U FFP.

# Cirrhotic Ascites and Edema

1. **Admit to:**
2. **Diagnosis:** Cirrhotic ascites & edema
3. **Condition:**
4. **Vital signs:** Vitals q4-6 hours; Call physician if BP >160/90, <90/60; P >120, <50; T >38.5°C; urine output < 25 cc/hr x 4h, or abnormal mental status.
5. **Activity:** Bed rest with legs elevated.
6. **Nursing:** I&O, daily weights, measure abdominal girth qd, guaiac all stools. No sedatives unless withdrawal signs appear.
7. **Diet:** 2500 calories, 100 gm protein; 500 mg sodium restriction; fluid restriction to 1-1.5 L/d (if hyponatremia, Na <130).
8. **IV Fluids:** Hep-lock with flush q shift.
9. **Special Medications:**
   - -Diurese to reduce weight by 0.5-1 kg/d (if edema) or 0.25 kg/d (if no edema).
   - -Spironolactone (Aldactone) 25-50 mg PO qid or 200 mg PO qAM, increase by 100 mg/d to max of 400 mg/d.
   - -Furosemide (Lasix)(ascites refractory to above) 40-120 mg PO or IV qd-bid. Add KCL 20-40 mEq PO qAM.
   - -Metolazone (Zaroxolyn) 5-20 mg PO qd.
   - -Ranitidine (Zantac) 150 mg PO bid.
   - -Vitamin K 10 mg SQ qd x 3d.
   - -Folic acid 1 mg PO qd.
   - -Thiamine 100 mg PO qd.
   - -Multivitamin PO qd.

   **Paracentesis:** Remove up to 5 L ascites if peripheral edema, tense ascites, or decreased diaphragmatic excursion. If large volume paracentesis without peripheral edema or with renal insufficiency, give salt-poor albumin 12.5 gm for each 2 liters of fluid removed (50 mL of 25% solution); infuse 25 mL before paracentesis and 25 mL 6h after.

**Also see Hepatic Encephalopathy, page 43.**

10. **Symptomatic Medications:**
    - -Docusate sodium (Colace) 100-200 mg PO qhs.
11. **Extras:** KUB, CXR, abdominal ultrasound, liver-spleen scan, GI consult.
12. **Labs:** Ammonia, CBC, SMA 7 & 12, LFT's, albumin, LDH, GGT, amylase, lipase, blood C&S, INR/PTT, blood alcohol. Urine creatinine, Na, K. HBsAg, anti-HBsAg/IgG, Hepatitis C virus antibody, alpha-1-antitrypsin.

**Ascitic Fluid**

**Tube 1** - Protein, albumin, specific gravity, glucose, bilirubin, amylase, lipase, triglyceride, LDH (3-5 mL, red top tube).

**Tube 2** - Cell count & differential (3-5 mL, purple top tube).

**Tube 3** - C&S, Gram stain, AFB, fungal (5-20 mL); inject 20 mL into blood culture bottles at bedside.

**Tube 4** - Cytology (>20 mL).

**Syringe** - pH (2 mL).

Concomitant serum albumin, LDH, total protein, glucose.

## Viral Hepatitis

1. **Admit to:**
2. **Diagnosis:** Hepatitis
3. **Condition:**
4. **Vital signs:** qid; Call physician if BP <90/60; T >38.5°C
5. **Activity:**
6. **Nursing:** Stool isolation, guaiac all stools.
7. **Diet:** Clear liquid (if nausea), low fat (if diarrhea).
8. **Special Medications:**
   -Ranitidine (Zantac) 150 mg PO bid or 150 mg in 250 D5W to run over 24 hours.
   -Vitamin K 10 mg SQ qd x 3d.
   -Multivitamin PO qd.
9. **Symptomatic Meds:**
   -Meperidine (Demerol) 25-100 mg IM q4-6h prn pain.
   -Trimethobenzamide (Tigan) 250 mg PO q6-8h prn pruritus or 200 mg rectal suppository q6-8h prn.
   -Hydroxyzine (Vistaril) 25 mg IM/PO q4-6h prn nausea or pruritus.
   -Diphenhydramine (Benadryl) 25-50 mg PO/IV q4-6h prn pruritus.
10. **Extras:** Liver/spleen scan, ultrasound, GI consult.
11. **Labs:** CBC, SMA 7 & 12, GGT, LDH, 5'-nucleotidase, amylase, lipase, INR/PTT; acetaminophen level, anti-HA IgM, HBsAg, hepatitis C virus antibody, HBcAg, HBeAg, hepatitis core antibody, anti-HBe, anti-HBs, HDV-RNA, anti-delta (IgM/IgG); alpha 1 antitrypsin level (with phenotype). ANA. Ferritin, serum iron, TIBC, ceruloplasmin; urine copper.

## Acute Pancreatitis

1. **Admit to:**
2. **Diagnosis:** Acute pancreatitis
3. **Condition:**
4. **Vital signs:** q1-4h, call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; urine output < 25 cc/hr.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Daily weights, I&O, fingerstick glucose qid, guaiac stools.
7. **Diet:** NPO
8. **IV Fluids:** 1-4 L NS over 1-3h, then D5 1/2 NS with 20 mEq KCL/L at 125 cc/h NG tube at low constant suction (if obstruction). Foley to closed drainage.
9. **Special Medications:**
   -Ranitidine (Zantac) 6.25-12.5 mg/h (0.2-0.4 mg/kg/h)(150- 300 mg in 500 mL D5W at 21 mL/h) IV or 50 mg IV q6-8h **OR**
   -Cimetidine (Tagamet) 37.5-100 mg/h IV or 300 mg IV q6-8h **OR**
   -Famotidine (Pepcid) 20 mg IV q12h.
   -Ticarcillin/clavulanate (Timentin) 3.1 gm IV or Ampicillin/sulbactam (Unasyn) 3.0 gm IV q6h or Imipenem (Primaxin) 0.5-1.0 gm IV q6h (best choice for pancreatitis ascites). Antibiotics not required in uncomplicated pancreatitis. Antibiotics are indicated for infected pseudocyst or pancreatitis ascites.
   -Heparin 5000 U SQ q12h.
   -Total Parenteral Nutrition, if malnutrition or if NPO for >7 days; see page 41, 112.

**10. Symptomatic Medications:**
-Meperidine 50-100 mg IM q3-4h prn pain.
**11. Extras:** Upright abdomen, portable CXR, ECG, ultrasound, CT with contrast. Surgery and GI consults.
**12. Labs:** CBC, platelets, SMA 7 & 12, ionized & total calcium, triglycerides, amylase, lipase, LDH, AST, ALT, GGT; blood C&S x 2, HBsAg, INR/PTT, type & hold 4-6 U PRBC & 2-4 U FFP. Pancreatic isoamylase, immunoreactive trypsin, chymotrypsin, elastase, CA 19-9 antigen. UA, urine culture.
**13. Other Orders and Meds:**

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## Empiric Therapy of Diarrhea

1. **Admit to:**
2. **Diagnosis:** Diarrhea
3. **Condition:**
4. **Vital signs:** tid; call physician if BP >160/90, <80/60; P >120; R>25; T >38.5°C
5. **Activity:** Up ad lib
6. **Nursing:** Daily weights, I&O, stool volumes
7. **Diet:** NPO except ice chips x 24h, then low residual elemental diet; no milk products.
8. **IV Fluids:** 1-3 L NS over 1-3 hours; then D5 1/2 NS with 40 mEq KCL/L at 15 cc/h.
9. **Special Medications:**

**Febrile or gross blood in stool or neutrophils on microscopic exam or prior travel:**
-Ciprofloxacin (Cipro) 500 mg PO bid x 10-14 days **OR**
-Norfloxacin (Noroxin) 400 mg PO bid **OR**
-Ofloxacin (Floxin) 300 mg bid **OR**
-Trimethoprim/SMX (Bactrim DS) one double strength (160/800 mg) tab PO bid x 10-14 days.

**Symptomatic Meds if indicated:**
-Kaopectate 60-90 cc PO qid or after each loose BM prn **OR**
-Loperamide (Imodium) 2-4 mg PO tid-qid prn, max 16 mg/d **OR**
-Diphenoxylate HCL (Lomotil) 1-2 tabs PO qid, max 12 tabs/day.
-Pepto Bismol 30 cc PO q30min x 8 hours.

**11. Extras:** Upright abdomen. GI consult.
**12. Labs:** SMA7 & 12, CBC with differential, UA, blood culture x 2. Amebic serum titers, HIV test.
**Stool studies:** Wright's stain for fecal leukocytes, ova & parasites x 3, C difficile toxin & culture, C&S, E coli 0157:H7 culture.
**13. Other Orders & Meds:**

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## Specific Therapy of Diarrhea

**Shigella:**
-Trimethoprim/SMX, (Bactrim) double strength tab PO bid x 5 days **OR**
-Ciprofloxacin (Cipro) 500 mg PO bid x 5 days

**Salmonella (bacteremia):**
-Ofloxacin (Floxin) 400 mg IV/PO q12h x 14 days **OR**
-Ciprofloxacin (Cipro) 400 mg IV q12h or 750 mg PO q12h x 14 days **OR**
-Trimethoprim/SMX (Bactrim) DS tab PO bid x 14 days **OR**
-Ceftriaxone (Rocephin) 2 gms IV q12h x 14 days.
**Campylobacter jejuni:**
-Erythromycin 250 mg PO qid x 5-10 days
**Enterotoxic/Enteroinvasive E coli (Travelers Diarrhea):**
-Ciprofloxacin 500 mg PO bid x 5-7 days **OR**
-Trimethoprim/SMX (Bactrim), double strength tab PO bid x 5-7 days.
**Antibiotic Associated & Pseudomembranous Colitis (Clostridium difficile)(discontinue offending antibiotic):**
-Metronidazole (Flagyl) 250 mg PO or IV qid x 10-14 days **OR**
-Vancomycin 125 mg PO qid x 10 days (500 PO qid x 10-14 days, if recurrent).
**AIDS ASSOCIATED DIARRHEA (severe refractory secretory diarrhea):**
-Octreotide (Sandostatin) 50-200 mcg SQ tid-qid prn severe refractory secratory diarrhea.
**Yersinia Enterocolitica (sepsis):**
-Trimethoprim/SMX (Bactrim), double strength tab PO bid x 5-7 days **OR**
-Ciprofloxacin 500 mg PO bid x 5-7 days **OR**.
-Ofloxacin (Floxin) 400 mg PO bid.
**Entamoeba Histolytica (Amebiasis):**
**Mild to Moderate Intestinal Disease:**
-Metronidazole (Flagyl) 750 mg PO tid x 10 days **OR**
-Tinidazole 2 gm per day PO x 3 days. **Followed By:**
-Iodoquinol 650 mg PO tid x 20 days **OR**
-Paromomycin 25-30 mg/kg/d PO in 3 divided doses x 7 days.
**Severe Intestinal Disease:**
-Metronidazole 750 mg PO tid x 10 days **OR**
-Tinidazole 600 mg PO bid x 5 days **Followed By:**
-Iodoquinol 650 mg PO tid x 20 days **OR**
-Paromomycin 25-30 mg/kg/d PO in 3 divided doses x 7 days.
**Giardia Lamblia:**
-Quinacrine HCL 100 mg PO tid x 5d **OR**
-Metronidazole 250 mg PO tid x 7 days.
**Other Orders & Meds:**

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## Ulcerative Colitis

1. **Admit to:**
2. **Diagnosis:** Ulcerative colitis/Crohn's disease.
3. **Condition:**
4. **Vital signs:** q4-6h; call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. **Activity:** Up ad lib in room.
6. **Nursing:** Daily weights, I&O.
7. **Diet:** NPO except for ice chips x 48h, then low residue or elemental diet, no milk products.
8. **IV Fluids:** 1-3 L NS over 1-3h, then D5 1/2 NS with 40 mEq KCL/L at 150 cc/hr

**9. Special Medications:**

-Sulfasalazine (Azulfidine) 0.5-1 gm PO bid, increase over 10 d as tolerated to 0.5-1.0 gm PO qid **OR**

-Olsalazine (Dipentum) 500 mg PO bid **OR**

-5-aminosalicylate (Mesalamine) 400-800 mg PO tid or 1 gm PO qid or enema 4 gm/60 mL PR qhs (retain for 8h) **OR**

-Mesalamine (Asacol) 400-800 mg PO q8h **OR**

-Hydrocortisone retention enema, 100 mg in 120 mL saline bid

-Methylprednisolone 10-20 mg IV q6h **OR**

-Hydrocortisone 100 mg IV q6h **OR**

-Prednisone 40-60 mg/d PO in divided doses.

**Other Medications:**

-B12, 100 mcg IM x 5d then 100-200 mcg IM q month.

-Multivitamin PO qAM or 1 ampule IV qAM.

-Folate 1 mg PO qd. (especially is sulfasalazine used)

**10. Symptomatic Medications:**

-Loperamide (Imodium) 2-4 mg PO tid-qid prn, max 16 mg/d (not in acute phase) **OR**

-Kaopectate 60-90 mL PO qid prn.

**11. Extras:** Upright abdomen. CXR. colonoscopy. GI consult.

**12. Labs:** CBC, SMA 7 & 12, Mg, ionized calcium, liver panel, blood C&S x 2; stool Wright's stain, stool for ova and parasites x 3 and enteric pathogens; urine culture; type and crossmatch for 2 units packed red blood cells, C difficile toxin assay.

**13. Other Orders and Meds:**

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## Parenteral Nutrition

**General Considerations:** Daily weights, I&O. Finger stick glucose qid.

**Central Parenteral Nutrition**:

-Infuse 40-50 mL/h of amino acid-dextrose solution in the first 24h; increase daily by 40 mL/hr increments until providing 1.3-2 x basal energy requirement & 1.2-1.7 gm protein/kg/d.

**Standard solution:**

| | |
|---|---|
| Amino acid sln (Aminosyn) 7-10% | 500 mL |
| Dextrose 40-70% | 500 mL |
| Sodium | 35 mEq |
| Potassium | 36 mEq |
| Chloride | 35 mEq |
| Calcium | 4.5 mEq |
| Phosphate | 9 mMol |
| Magnesium | 8.0 mEq |
| Acetate | 82-104 mEq |
| Multi-Trace Element Formula (zinc, copper, manganese, chromium) | 1 mL/d |
| Regular insulin (if indicated) | 10-60 U/L |
| Multivitamin(12)(2 amp) (vitamin C, A, D, E, B12, thiamine, riboflavin, pyridoxine, niacinamide, pantothenate, biotin, folate) | 10 mL/d |
| Vitamin K (in solution, SQ, IM) | 10 mg/week |
| Vitamin B12 | 1000 mcg/week |

Selenium (after 20 days of continuous TPN) . . . . . 80 mcg/d

Intralipid 20% 500 mL/d IVPB; infuse in parallel with standard solution at 1 mL/min x 15 min; if no adverse reactions, increase to 100 mL/hr. Obtain serum triglyceride 6h after end of infusion (maintain <250 mg/dL).

**CYCLIC TPN** 12h night schedule; Taper continuous infusion in morning by reducing rate to half original rate for 1 hour. Further reduce rate by half for an additional hour, then discontinue. Finger stick glucose q4-6h; Restart TPN in afternoon. Taper at beginning & end of cycle. Final rate of 185 mL/hr for 9-10 h and 2 hours of taper at each end for total of 2000 mL.

**Peripheral Parenteral Supplementation**:

-3% amino acid sln (ProCalamine) up to 3 L/d at 125 cc/h **OR**

-Combine 500 mL amino acid solution 7% or 10% (Aminosyn) & 500 mL 20% dextrose & electrolyte additive. Infuse at up to 100 cc/hr in parallel with:

-Intralipid 10% or 20% at 1 mL/min for 15 min (test dose); if no adverse reactions, infuse 500 mL/d at 21 mLs/h over 24h, or up to 100 mLs/h over 5 hours daily.

-Draw triglyceride level 6h after end of Intralipid infusion.

-Change IV site q3-4 days.

**7. Special Medications:**

-Cimetidine (Tagamet) 300 mg IV q6-8h or in TPN **OR**

-Ranitidine (Zantac) 50 mg IV q6-8h or in TPN bid.

-Insulin sliding scale.

**8. Extras:** Nutrition consult.

**9. Labs:**

**Baseline** - draw all labs below.

**Daily labs** - SMA7, osmolality, CBC, cholesterol, triglyceride (6 h after infusion), urine glucose & specific gravity.

**Twice weekly Labs** - Cal, phosphate, SMA-12, magnesium

**Weekly Labs when indicated** - Protein, Mg, iron, TIBC, transferrin, INR/PTT, zinc, copper, B12, Folate, 24h urine nitrogen & creatinine. Pre-albumin, retinol-binding protein.

**10. Other Orders and Meds:**

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## Enteral Nutrition

**General Considerations:** Daily weights, I&O, nasoduodenal feeding tube. HOB at 30° while enteral feeding & 2 hours after completion. Record bowel movements.

**Enteral Bolus Feeding** - Give 50-100 mL of enteral solution (Jevity, Vionex, Osmolite) q3h initially. Increase amount in 50 mL steps to max of 250-300 mL q3-4h; 30 kcal of nonprotein calories/kg/d & 1.5 gm protein/kg/d. Before each feeding measure residual volume, and delay feeding by 1h if >100 mL. Flush tube with 100 cc of water after each bolus.

**Continuous enteral infusion** - Initial enteral solution (Jevity, Vionex, Osmolite) 30 mL/hr. Measure residual volume q1h x 12h then tid; hold feeding for 1h if >100 mL. Increase rate by 25-50 mL/hr at 24 hr intervals as tolerated until final rate of 50-100 mL/hr as tolerated. 3 Tablespoonfuls of protein powder (Promix) may be added to each 500 cc of solution. Flush tube with 100 cc water q8h.

**Special Medications:**
-Metoclopramide (Reglan) 10-20 mg PO or in J tube q6h **OR**
-Cisapride (Propulsid) 10-20 mg via nasogastric tube qid.
-Cimetidine (Tagamet) 400 mg PO bid **OR**
-Ranitidine (Zantac)150 mg PO bid.

**Symptomatic Medications:**
-Loperamide (Imodium) 2-4 mg PO/J-tube q6h, max 16 mg/d prn **OR**
-Diphenoxylate/atropine (Lomotil) 1-2 tabs or 5-10 mL (2.5 mg/5 mLs) PO/J-tube q4-6h prn, max 12 tabs/d **OR**
-Codeine sulfate 30 mg PO or in J-tube q6h.
-Kaopectate 30 cc PO or in J-tube q8h.

**Extras:** CXR, plain film for tube placement, nutrition consult.

**Labs:**
**Daily labs** - SMA7, osmolality, CBC, cholesterol, triglyceride. SMA-12
**Weekly Labs when indicated** - Protein, Mg, INR/PTT, 24h urine nitrogen & creatinine. Pre-albumin, retinol-binding protein.

## Hepatic Encephalopathy

1. **Admit to:**
2. **Diagnosis:** Hepatic encephalopathy
3. **Condition:**
4. **Vital signs:** q1-4h, neurochecks q4h; Call physician if BP >160/90,<90/60; P >120,<50; R>25,<10; T >38.5°C
5. **Allergies:** Avoid sedatives, diuretics, NSAIDS or hepatotoxic drugs.
6. **Activity:** Bed rest.
7. **Nursing:** Keep head-of-bed at 40 degrees, guaiac stools; turn patient q2h while awake, chart stools and notify physician if patient does not have a stool at least twice a day. Seizure precautions, egg crate mattress, soft restraints prn. Record inputs and outputs.
8. **Diet:** Nasogastric enteral feedings at 30 mL/hr. Increase rate by 25-50 mL/hr at 24 hr intervals as tolerated until final rate of 50-100 mL/hr as tolerated. No dietary protein for 8 hours. Give 2000 calories per day of low protein diet.
9. **IV Fluids:** D5W at TKO, Foley to closed drainage.
10. **Special Medications:**
-Sorbitol 500 mL in 200 mL of water PO now.
-Lactulose 30-45 mL PO q1h x 3 doses, then 15-45 mL PO bid-qid titrate to produce 3 soft stools/d **OR**
-Lactulose enema 300 mL in 700 mL of tap water bid-qid, (may use rectal balloon catheter to retain 30-60 min, left side Trendelenburg x 15 min, then right side with head elevated); may give cleansing Fleet enema x 2 before lactulose **AND**
-Neomycin 1 gm PO q4-6h (4-12 g/d) **OR**
-Metronidazole (Flagyl) 250 mg PO q6h.
-Ranitidine (Zantac) 50 mg IV q6-8h or 150 mg PO bid **OR**
-Famotidine (Pepcid) 20 mg IV/PO q12h.
-Flumazenil (Romazicon) 0.2 mg (2 mL) IV over 30 seconds q1min until a total dose of 3 mg; if a partial response occurs, continue 0.5 mg doses until a total of 5 mg.
-Multivitamin PO qAM or 1 ampule IV qAM.
-Folic acid 1 mg PO/IV qd.

-Thiamine 100 mg PO/IV qd.
-Vitamin K 10 mg IM qd x 3 days if elevated PT (INR)

**11. Extras:** CXR, ECG, GI & dietetics consults.

**12. Labs:** Ammonia, CBC, platelets, SMA 7 & 12, Mg, Cal, AST, ALT, GGT, LDH, alkaline phosphatase, protein, albumin, bilirubin, INR/PTT, ABG, blood C&S x 2, hepatitis panel. UA.

## Alcohol Withdrawal

1. **Admit to:**
2. **Diagnosis:** Alcohol withdrawals / Delirium tremens.
3. **Condition:**
4. **Vital signs:** q4-6h; Call physician if BP >160/90, <90/60; P >130, <50; R>25, <10; T >38.5°C; or increase in agitation, confusion, tremor, or change in neurological status.
5. **Activity:**
6. **Nursing:** Seizure precautions. Soft restraints prn.
7. **Diet:** Regular, push fluids.
8. **IV Fluids:** Hep-lock or D5 1/2 NS at 100-175 cc/h.
9. **Special Medications:**

   **Withdrawal syndrome:**
   -Chlordiazepoxide (Librium) 50-100 mg PO/IV q6h x 3 days **OR**
   -Diazepam (Valium) 5-20 mg PO/IV q6-8h

   **Delirium tremens:**
   -Chlordiazepoxide 100 mg slow IV push or PO, repeat q4-6h prn agitation or tremor x 24h; max 500 mg/d. Then give 50-100 mg PO q6h prn agitation or tremor **OR**
   -Diazepam (Valium) 5 mg slow IV push repeat q6h until calm, then 5-10 mg PO q4-6h.

   **Seizures:**
   -Diazepam 5-10 mg IV q5-15 min prn seizures, may repeat 5 mg q10-15min prn; max dose 30 mg.
10. **Symptomatic Medications:**
    -Magnesium sulfate 1-8 gm in 100 mL D5W over 2-8h qd.
    -Multivitamin 1 amp IV, then 1 tab PO qd.
    -Folate 1 mg PO qd.
    -Thiamine 100 mg PO qd.
    -Acetaminophen 625 mg PO q4-6h prn headache.
    -Metoclopramide (Reglan) 10 mg PO/IV q6h prn nausea.
11. **Extras:** CXR, ECG. Alcohol rehabilitation & social work consult.
12. **Labs:** CBC, SMA 7 & 12, Mg, amylase, lipase, liver panel, VDRL, urine drug screens. UA, INR/PTT.
13. **Other Orders and Meds:**

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# *Toxicology*

## Poisoning and Drug Overdose

**Decontamination:**

**Ipecac (not if ingestion of acid/base, caustics, tricyclics, or if obtundent, impaired gag reflex, seizing):**

-Ipecac syrup (only if <1h after ingestion), 30 mL with 240-480 mL liquid; may repeat x 1 after 30 minutes if no emesis.

**Gastric Lavage:** Place patient left side down, place nasogastric tube and check position by injecting air & auscultating. NS lavage until clear fluid, then leave activated charcoal or other antidote prn. Gastric lavage is contraindicated for corrosives.

**Cathartics:**

-Magnesium citrate 6% sln 150-300 mL PO

-Magnesium sulfate 10% solution 150-300 mL PO.

**Activated Charcoal:** 50 gm PO (first dose should be given using product containing sorbitol as cathartic). Repeat q2-6h if indicated.

**Hemodialysis:** Indicated for isopropanol, methanol, ethylene glycol, severe salicylate intoxication (>100 mg/dL), lithium, theophylline (if neurotoxicity, seizures, or coma).

**Antidotes:**

**Narcotic or Propoxyphene Overdose:**

-Naloxone hydrochloride (Narcan) 0.4 mg IV/ET/IM/SC, may repeat q2min.

**Methanol or Ethylene Glycol Overdose:**

-Ethanol 60-80 mL (10% inj sln) IV over 30min, then 0.8-1.4 mL/kg/h. Maintain ethanol level 100-150 mg/100 mL.

**Carbon Monoxide Overdose:**

-Hyperbaric oxygen therapy or 100% oxygen by mask if hyperbaric oxygen not available.

**Phenothiazine or Extrapyramidal Reaction:**

-Diphenhydramine (Benadryl) 25-50 mg IV/IM q6h x 4 doses; followed by 25-50 mg IV/PO q6h for 24-72h prn **OR**

-Benztropine (Cogentin) 1-2 mg IV, then 1-2 mg IV/PO bid prn.

**Benzodiazepine Overdose (Diazepam, midazolam, lorazepam, alprazolam):**

-Flumazenil (Romazicon) 0.2 mg (2 mL) IV over 30 seconds q1min until a total dose of 3 mg; if a partial response occurs, continue 0.5 mg doses until a total of 5 mg. If the patient has continued sedation (respiratory depression does not reverse appreciably), repeat the above regimen or start a continuous IV infusion 0.1-0.5 mg/h. Excessive doses, beyond reversal of sedation, may cause seizures.

**Labs:** Drug screen (serum, gastric, urine); blood levels, SMA 7, fingerstick glucose, CBC, LFT's, ECG.

## Acetaminophen Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** Acetaminophen overdose
3. **Condition:**
4. **Vital signs:** q1-4h with neurochecks; Call physician if BP >160/90, <90/60; P >130, <50 <50; R>25, <10; urine output <20 cc/h for 3 hours.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** I&O, aspiration & seizure precautions. Place large bore (Ewald) NG tube, then lavage with 2 L of NS.
7. **Diet:** NPO
8. **IV Fluids:**
9. **Special Medications:**
   -Activated Charcoal 30-100 gm doses, remove via NG suction prior to acetylcysteine.
   -Acetylcysteine (Mucomyst, NAC) loading 140 mg/kg PO, then 70 mg/kg PO q4h x 17 doses (dilute to 5% sln)(follow acetaminophen levels) **OR** IV acetylcysteine 150 mg/kg in 200 mL D5W IV over 15 min, followed by 50 mg/kg in 500 mL D5W, infused over 4h, followed by 100 mg/kg in 1000 mL of D5W over next 16h. Filter solution through 0.22 micron filter prior to administration. Complete all 17 doses, even after acetaminophen level falls below critical value.
   -Phytonadione 5 mg IV/IM/SQ (if INR increased).
   -Fresh frozen plasma 2-4 U (if INR increased).
   -Trimethobenzamide (Tigan) 100-200 mg IM/PR q6h prn nausea

**10. Extras:** ECG. Nephrology consult for possible hemodialysis or charcoal hemoperfusion. GI consult.

**11. Labs:** CBC, SMA 7&12, LFT's, INR/PTT, acetaminophen level now & in 4h (plot on nomogram). UA.

## Theophylline Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** Theophylline overdose
3. **Condition:**
4. **Vital signs:** Neurochecks; Call physician if: BP >160/90, <90/60; P >130; <50; R >25, <10.
5. **Activity:** Bed rest
6. **Nursing:** ECG monitoring until level <20 mcg/mL, aspiration & seizure precautions. Insert single lumen NG tube and lavage with normal saline if recent ingestion.
7. **Diet:** NPO
8. **IV Fluids:** D5 1/2 NS at 125 cc/h
9. **Special Medications:**
   -Activated Charcoal 50 gm PO q4-6h, with sorbitol cathartic (30 mLs of 70% sln) regardless of time of ingestion, until theophylline level <20 mcg/mL. Maintain head-of-bed at 30-45 degrees to prevent aspiration of charcoal.
   -Charcoal hemoperfusion is indicated if serum level >60 mcg/mL, or signs of neurotoxicity, seizure, coma.

**Seizure (support oxygenation & respirations):** Phenobarbital or lorazepam, see page 50, 118.

**10. Extras:** ECG.
**11. Labs:** CBC, SMA 7 & 12, theophylline level now & in 4h; INR/PTT, liver panel. UA..

## Tricyclic Antidepressant Overdose

1. **Admit to:** Medical intensive care unit.
2. **Diagnosis:** TCA Overdose
3. **Condition:**
4. **Vital Signs:** Neurochecks q1h.
5. **Activity:** Bedrest.
6. **Nursing:** Continuous suicide observation. ECG monitoring, measure QRS width, I&O, aspiration and seizure precautions. Place single lumen nasogastric tube and lavage with saline if recent ingestion.
7. **Diet:** NPO
8. **IV Fluids:** NS at 100-150 cc/hr.
9. **Special Medications:**
   -Activated charcoal premixed with Sorbitol 50 gms via NG tube q4-6h round-the-clock until TCA level decreases to therapeutic range. Maintain head-of-bed at 30-45 degree angle to prevent charcoal aspiration.
   -Magnesium citrate 300 mLs via nasogastric tube x 1 dose.
10. **Cardiac Toxicity:** Alkalinization is a cardioprotective measure and has no influence on drug elimination. Treatment goal is to achieve an arterial pH of 7.50-7.55.
    -If mechanical ventilation is necessary, hyperventilate to maintain desired pH.
    -Administer sodium bicarbonate 50-100 mEq (1-2 amps or 1-2 mEq/kg) IV over 5-10 min, followed by infusion of sodium bicarbonate 2 amps in D5W 1 L at 100-150 cc/h. Adjust rate to maintain pH 7.50-7.55.
11. **Extras:** ECG.
12. **Labs:** Urine toxicology screen, serum TCA levels, liver panel, CBC, SMA-7 & 12, UA.

# *Neurology*

## Ischemic Stroke

1. **Admit to:**
2. **Diagnosis:** Ischemic stroke
3. **Condition:**
4. **Vital signs:** q1-4h with neurochecks; call physician if BP >200/110, <90/60; P >120, <50; R>25, <10; T >38.5°C; or change in neurologic status.
5. **Activity:** Bedrest for 24 hours, then up with assistance and in chair tid if tolerated.
6. **Nursing:** head-of-bed at 30 degrees, turn q2h when awake, range of motion exercises qid, Foley catheter, eggcrate mattress, sheepskin blanket on bed; heal & elbow pads. Guaiac stools, I&O's.
7. **Diet:** NPO until swallowing ability confirmed or dysphagia ground with thickened liquids.
8. **IV Fluids:** LR at 30-100 cc/h.
9. **Special Medications:**

**Completed Ischemic Stroke:**

-Aspirin enteric coated 325 mg PO qd **OR**
-Ticlopidine (Ticlid) 250 mg PO bid.

**Cardiogenic, Evolving, or Vertebrobasilar Ischemic Stroke**:

-Heparin, start immediately without bolus in non-hemorrhagic, small to moderate size infarcts: 700-800 U/h (12 U/kg/h) IV (25,000 U in 500 mL D5W); adjust q6-12h until PTT 1.5-2.0 x control.
-Warfarin 5.0-7.5 mg PO qd x 3d, then 2-4 mg (2-15 mg/d) PO qd. Maintain International Normalizing Ratio of 2-3 Maintain warfarin for patients with evidence of cardiogenic or vertebrobasilar sources).

10. **Symptomatic Medications:**
-Docusate sodium (Colace) 100 mg PO qhs.
-Milk of magnesia 30 mL PO qd prn constipation **OR**
-Bisacodyl (Dulcolax) 10-15 mg PO qhs or 10 mg PR prn.
-Ranitidine (Zantac) 50 mg IV q6-8h or 150 mg PO bid **OR**
-Acetaminophen 1-2 tabs PO/PR q4-6h prn temp > 100 or headache.
-Heparin 5,000 SQ bid.

**11. Extras:** CXR, ECG, CT without contrast or MRI with or without gadolinium; carotid duplex scan with vertebral artery imaging; echocardiogram; swallowing studies. Physical therapy consult for passive and active range of motion exercises; neurology, rehab medicine consults.

**12. Labs:** CBC, glucose, SMA 7 & 12, fasting lipid profile, VDRL, ESR; drug levels, INR/PTT, UA. Thrombosis panel, lupus anticoagulant, and anticardiolipin antibody.

# Transient Ischemic Attack

1. **Admit to:**
2. **Diagnosis:** Transient ischemic attack
3. **Condition:**
4. **Vital signs:** q1-4h with neurochecks; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or change in neurologic status.
5. **Activity:** Bed rest until AM, then up as tolerated.
6. **Nursing:** Guaiac stools.
7. **Diet:** Dysphagia ground with thickened liquids or NPO.
8. **IV Fluids:** Heplock with flush q shift.
9. **Special Medications:**
   -Aspirin 325 mg PO qd **OR**
   -Ticlopidine (Ticlid) 250 mg PO bid **OR**
   -Heparin (only if recurrent TIA's; cardiogenic or vertebrobasilar source for emboli), 700-800 U/h (12 U/kg/h) IV infusion, without bolus (25,000 U in 500 mL D5W); adjust q6-12h until PTT 1.5-2.0 x control.
   -Warfarin (Coumadin) 5.0-7.5 mg PO qd x 3d, then 2-4 mg PO qd. Maintain INR of 2.0-3; maintain warfarin for patients with evidence of cardiogenic or vertebrobasilar sources.
10. **Symptomatic Medications:**
   -Docusate sodium (Colace) 100 mg PO qhs.
   -Milk of magnesia 30 mL PO qd prn constipation
   -Ranitidine (Zantac) 150 mg PO bid.
11. **Extras:** CXR, ECG, CT without contrast; carotid duplex scan, echocardiogram. Physical therapy, neurology consults.
12. **Labs:** CBC, glucose, SMA 7 & 12, fasting lipid profile, VDRL, drug levels, INR/PTT, UA. Thrombosis panel, lupus anticoagulant, and anticardiolipin antibody.

# Subarachnoid Hemorrhage

**Treatment:**
- -Stat neurosurgery consult.
- - Head of bed at 20 degrees, turn patient q2h, range of motion exercises qid, Foley catheter, eggcrate mattress, heal & elbow pads. Guaiac stools.
- -Keep room dark and quiet; no rectal exams; strict bedrest. Neurologic checks q1h for 12 hours, then q2h for 12 hours, then q4h; call physician if abrupt change in neurologic status.
- -Diet: Restrict total fluids to 1000 mL/day; remainder of diet as tolerated (if possible, should he high-residue with prunes).
- -Nimodipine (Nimotop) 60 mg PO or via NG tube q4h x 21d, must start within 96 hours (not useful in subarachnoid hemorrhage due to trauma).

**Hypertension:**
- -Nitroprusside sodium, 0.1-0.5 mcg/kg/min (50-200 mg/250 mL NS), titrate to control blood pressure.
- -Phenytoin (if seizure) IV load 15 mg/kg IV in NS (infuse at max 50 mg/min) in dextrose free IV, then 300 mg PO/IV qAM (4-6 mg/kg/d).
- -Codeine 30-60 mg PO, IM, IV, or SQ q4-6h prn head pain.

**Extras:** CXR, ECG, CT without contrast; MRI angiogram; cerebral angiogram. Neurology, neurosurgery consults.

**Labs:** CBC, SMA 7 & 12, VDRL, UA.

## Seizure and Status Epilepticus

1. **Admit to:**
2. **Diagnosis:** Seizure
3. **Condition:**
4. **Vital signs:** q1-4h with neurochecks; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or any change in neurological status.
5. **Activity:** Bed rest
6. **Nursing:** Finger stick glucose. Seizure precautions with bed rails up, padded tongue blade at bedside. EEG monitoring. Observe patient as frequently as possible.
7. **Diet:** NPO x 24h, then regular diet if alert.
8. **IV Fluids:** D5 1/2 NS at 100 cc/hr; change to hep-lock when taking PO.
9. **Special Medications:**

**Status Epilepticus:**

1. Maintain airway.
2. The patient should be positioned laterally with the head down, in order to promote drainage of secretions and prevent aspiration. The head and extremities should be cushioned to prevent injury.
3. During the tonic portion of the seizure, the teeth are tightly clenched. During the clonic phase that follows, however, a bite block or other soft object should be inserted into the mouth to prevent injury to the tongue.
4. 100% $O_2$ by mask, obtain brief history & physical, fingerstick glucose.
5. Secure IV access and draw blood for serum glucose analysis. Give **glucose, 50 mL of 50%** (1 amp) IV (in children, 4 mL/kg of 25% dextrose). Give **thiamine**, 100 mg IV.
6. **Initial Control:**
   **Lorazepam (Ativan)** 4-8 mg (0.1 mg/kg; not to exceed 2 mg/min) IV at 1-2 mg/min. May repeat 4-8 mg q5-10min (max 80 mg/24h) **OR**
   **Diazepam**, 5-20 mg slow IV at 1-2 mg/min. Repeat 5-10 mg q5-10 min prn (max 100 mg/24h).
7. **Definitive Seizure Control:**
   **Phenytoin** 15-20 mg/kg load, in NS at 50 mg/min. Repeat 100-150 mg IV q30min, max 1.5 gms; monitor BP & ECG (QT interval). Hypotension may occur but should not preclude phenytoin; reduce the rate.
   **If Seizures Persist, Intubate Patient, Administer Phenobarbital** 120-260 mg (10-20 mg/kg) IV at 50 mg/min, repeat 20 mg/kg q15min; additional phenobarbital may be given, up to max of 30-60 mg/kg.
8. **If Seizures Persist, Consider:** Induction of Coma: Pentobarbital 10-15 mg/kg IV over 1-2h, then 1-1.5 mg/kg/h continuous infusion.
9. **Consider Intubation and General Anesthesia**

**Maintenance Therapy for Epilepsy:**

**Primary Generalized:**

**First Line Therapy:**

-Carbamazepine (Tegretol) 200-400 mg PO tid [100, 200 mg]. Pre-treatment blood counts, then weekly for 6 weeks, then monthly indefinitely.

-Phenytoin (Dilantin) loading dose of 400 mg followed by 300 mg q4h x 2 doses (total of 1 g), then 300 mg qd or 100 mg tid or 200 mg bid [30, 50,

100 mg].
-Valproic acid (Depakene) 250-500 mg PO tid-qid [250 mg].
-Divalproex (Depakote) 15-30 mg/kg/d PO [125, 250, 500 mg]; less GI irritation than valproic acid.

**Second Line Therapy:**
-Phenobarbital 30-120 mg PO bid [8, 16, 32, 65, 100 mg].
-Primidone (Mysoline) 250-500 mg PO tid [50, 250 mg]; metabolized to Phenobarbital.
-Felbamate (Felbatol) 1200-2400 mg PO qd in 3-4 divided doses, max 3600 mg/d [400,600 mg; 600 mg/5 mL susp]; adjunct therapy; high incidence of aplastic anemia.
-Gabapentin (Neurontin), 300-400 mg PO bid-tid; max 1800 mg/day [100, 300, 400 mg]; adjunct therapy.
-Lamotrigine (Lamictal) 50 mg PO qd initially, then 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy .

**Partial Seizure:**
-Carbamazepine (Tegretol) 200-400 mg PO tid [100, 200 mg].
-Valproic acid (Depakene) 250-500 mg PO tid-qid [250 mg].
-Divalproex (Depakote) 15-30 mg/kg/d PO [125, 250, 500 mg]; less GI irritation than valproic acid.
-Phenytoin 300 mg PO qd or 200 mg PO bid [30, 50, 100].
-Phenobarbital 30-120 mg PO tid or qd [8, 16, 32, 65, 100 mg].
-Primidone (Mysoline) 250-500 mg PO tid [50, 250 mg]; metabolized to phenobarbital.
-Felbamate (Felbatol) 1200-2400 mg PO qd in 3-4 divided doses, max 3600 mg/d [400,600 mg; 600 mg/5 mL susp]; adjunct therapy; high incidence of aplastic anemia; high incidence of aplastic anemia.
-Gabapentin (Neurontin), 300-400 mg PO bid-tid; max 1800 mg/day [100, 300, 400 mg]; adjunct therapy.
-Lamotrigine (Lamictal) 50 mg PO qd initially, then 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy .

**Absence (Petit Mal):**
-Ethosuximide (Zarontin) 250-500 mg PO tid-qid [250 mg].
-Valproate 250-500 mg PO tid-qid [250 mg].
-Divalproex (Depakote) 15-30 mg/kg/d PO [125, 250, 500 mg].
-Clonazepam (Klonopin) 0.5-5 mg PO bid-qid [0.5, 1, 2 mg].
-Lamotrigine (Lamictal) 50 mg PO qd initially, then 50-250 mg PO bid [25, 100, 150, 200 mg]; adjunct therapy .

**Atypical Absence, Myoclonic:**
-Valproate 250-500 mg PO tid-qid [250 mg]; high GI irritation.
-Divalproex (Depakote) 15-30 mg/kg/d PO [125, 250, 500 mg]. Less GI irritation.
-Clonazepam (Klonopin) 0.5-5 mg PO bid-qid [0.5, 1, 2 mg].
-Gabapentin (Neurontin), 300-400 mg PO bid-tid; max 1800 mg/day [100, 300, 400 mg].

**10. Extras:** MRI with & without gadolinium or CT; EEG (with photic stimulation, hyperventilation, sleep deprivation, awake and asleep tracings); portable CXR, ECG.

**11. Labs:** CBC, SMA 7, glucose, Mg, calcium, phosphate, liver panel; blood alcohol; ammonia levels, VDRL, anticonvulsant levels. UA, drug screen.

# *Endocrinology*

## Diabetic Ketoacidosis

1. **Admit to:**
2. **Diagnosis:** Diabetic ketoacidosis
3. **Condition:**
4. **Vital signs:** q1h, postural BP & pulse; Call physician if BP >160/90, <90/60; P >140, <50; R >30, <10; T >38.5°C; or urine output < 20 mL/hr for more than 2 hours.
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Daily weights, I&O. Foley to closed drainage. Record labs on flow sheet.
7. **Diet:** NPO for 12 hours, then clear liquids as tolerated. Tomorrow begin 1500 calorie American Diabetic Association diabetic diet.
8. **IV Fluids:**

0.5-5 L NS over 1-5h (≥16 gauge), infuse at 400-1000 mL/h until hemodynamically stable, then change to 0.45% saline at 150-400 cc/hr; keep urine output > 30-60 mL/h. If sodium is greater than 155, use 1/2 NS as IV fluid.

Add KCL when no ECG signs of hyperkalemia (peaked T) & urine output adequate, serum K+ ≤ 5.8 mEq/L.

Concentration.....20-40 mEq KCL/L
Rate.....10-40 mEq KCL/hr

May use K phosphate, 20-40 mEq/L, in place of KCL if low phosphate.

Change to **D5** 0.45% saline with 20-40 mEq KCL or K phosphate per liter when blood glucose 250-300.

9. **Special Medications:**
   - -Oxygen at 2-5 L/min by NC.
   - -Insulin Regular (Humulin) 7-10 units (0.1 U/kg) IV bolus, then 7-10 U/h IV infusion (0.1 U/kg/h) (50 U in 250 mL of 0.9% saline at 35 mL/hr) (flush IV tubing with 20 mL of insulin sln before starting infusion). Adjust insulin infusion to decrease serum glucose by 100 mg/dL or less per hour.
   - -After 2 hr of therapy, if bicarbonate level not rising and anion gap not falling, double insulin infusion rate; when bicarbonate level >16 mEq/L and anion gap <16 mEq/L, decrease insulin infusion rate by half
   - -When the glucose level reaches 250 mg/dL, 5% dextrose should be added to the replacement fluids with KCL 20-40 mEq/L.
   - -Use 10% glucose at 50-100 mL/h if anion gap still present, & serum glucose <100 mg/dL while on insulin infusion.
   - -Change to subcutaneous insulin when anion gap cleared; discontinue insulin drip only 1-2h after subcutaneous dose.
10. **Extras:** Portable CXR, ECG.
11. **Labs:** Fingerstick glucose q1-2h. SMA 7 q4-6h. SMA 12, pH, bicarbonate, phosphate, amylase, lipase, hemoglobin A1c; CBC, blood and sputum C&S x 2. Consider cardiac enzymes. UA, urine C&S, serum pregnancy test.

# Thyrotoxicosis and Hyperthyroidism

1. **Admit to:**
2. **Diagnosis:** Thyrotoxicosis
3. **Condition:**
4. **Vital signs:** q1-4h; Call physician if BP >160/90, <90/60; P >130, <50; R>25, <10; T >38.5°C
5. **Activity:** Bed rest
6. **Nursing:** Cooling blanket prn temp >39°C, I&O. Oxygen 2-4 L/min by nasal cannula.
7. **Diet:** Regular
8. **IV Fluids:** D5 1/2 NS with 20 mEq KCL at 125 cc/h.
9. **Special Medications:**

**Thyrotoxicosis & Hyperthyroidism:**

-Propylthiouracil 300-400 mg PO, then 50-250 mg PO q4-8h, up to 1200 mg/d, usual maintenance dose 50 mg PO tid **OR**

-Methimazole (Tapazole) 30-60 mg PO, then maintenance of 15 mg PO qd-bid **AND**

-Sodium iodide solution (Lugol's solution), 2-6 drops tid; one hour after propylthiouracil **AND**

-Propranolol 40-160 mg PO q6h or 5-10 mg/h, max 2-5 mg IV q4h or propranolol-LA (Inderal-LA), 80-120 mg PO qd [60, 80, 120, 160 mg] **AND**

-Hydrocortisone IV 100 mg/L q6h.

-Multivitamin tablet PO qd.

-Acetaminophen (Tylenol) 1-2 tabs PO q4-6h prn temp >38°C.

-Triazolam (Halcion) 0.125-0.5 mg PO qhs prn sleep **OR**

-Lorazepam (Ativan) 1-2 mg IV/IM/PO q4-8h prn anxiety or nervousness.

10. **Extras:** CXR PA & LAT, ECG, endocrine consult. If visual symptoms, obtain ophthalmology consult (rule out exophthalmos and/or optic neuropathy).
11. **Labs:** CBC, SMA 7&12; sensitive TSH, free T4. UA

# Nephrology

## Renal Failure

1. **Admit to:**
2. **Diagnosis:** Renal Failure
3. **Condition:**
4. **Vital signs:** tid, postural vitals qAM; Call physician if QRS complex > 0.14 sec; urine output <20 cc/hr; BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C
5. **Allergies:** Avoid magnesium containing antacids, salt substitutes, NSAIDS, & other nephrotoxins. Discontinue phosphate or potassium supplements unless depleted.
6. **Activity:** Bed rest.
7. **Nursing:** Daily weights, I&O, chart urine output q2h; if no urine output for 4h, I&O cath or Foley; Guaiac stools.
8. **Diet:** Renal diet of high biologic value protein of 0.6 to 0.8 g/kg, sodium 2 g, potassium 1 mEq/kg, and at least 35 kcal/kg of nonprotein calories. In oliguric patients, daily fluid intake should be restricted to less than 1 L after volume has been normalized.
9. **IV Fluids:** D5W at TKO.
10. **Special Medications:**
    - -Consider fluid challenge (to rule out pre-renal azotemia if not fluid overloaded) with 500-1000 mL NS IV over 30-60 min. In acute renal failure, I&O cath & check postvoid residual to rule out obstruction.
    - -Furosemide (Lasix) 80-320 mg IV bolus over 10-60 min, double the dose if no response in 2h to total max 1000 mg/24h or furosemide 1000 mg in 250 mLs D5W at 20-40 mg/hr continuous IV infusion. Diuretics should be administered only after adequate central volume has been attained. **OR**
    - -Bumetanide (Bumex) 1-2 mg IV bolus over 1-20 min; double the dose if no response in 1-2 h to total max 10 mg/day.
    - -Metolazone (Zaroxolyn) 5-10 mg PO (max 20 mg/24h)
    - -Dopamine (Intropin) 1-3 mcg/kg per minute IV.
    - -Mild hyperkalemia may be treated with sodium polystyrene sulfonate (Kayexalate), 15-30 g orally every 4-6 hours. See page 56.
    - -Hyperphosphatemia can be controlled with aluminum hydroxide (Amphojel) 5-10 mL or 1-2 tablets PO given with meals tid.
    - -Metabolic acidosis may be treated with sodium bicarbonate to maintain the serum pH >7.2 and the bicarbonate level ≥20 mEq/L. 44-132 mEq (1-3 amps of 7.5%) IV over 5 min, repeat in 10-15 min. Followed by infusion of 2-3 amps in 500 cc of D5W, titrated over 2-4 h.
    - -Discontinue potentially nephrotoxic meds; aminoglycosides, NSAIDS, ACE-inhibitors, sulfonamides, amphotericin. Adjust all meds to creatinine clearance, & remove potassium from IV.
11. **Extras:** CXR, ECG, renal ultrasound, renal scan, nephrology & dietetics consults.
12. **Labs:** CBC, platelets, SMA 7 & 12, potassium, magnesium, phosphate, calcium, uric acid, osmolality, BUN. ESR, INR/PTT. ANA.

Urine specific gravity, UA with micro, urine C&S; 1st AM spot urine electrolytes, creatinine, pH, osmolality, urea; Wright's stain, eosinophiles, electrophoresis. 24h urine protein, creatinine, sodium, fractional excretion of sodium.

## Nephrolithiasis

1. **Admit to:**
2. **Diagnosis:** Nephrolithiasis
3. **Condition:**
4. **Vital signs:** q shift; Call physician if urine output <30 cc/hr; BP >160/90, <90/60; T >38.5°C
5. **Activity:** Bed rest with bedside commode.
6. **Nursing:** Strain urine, measure inputs and outputs. Place Foley, if no urine for 2 hours.
7. **Diet:** Regular, push oral fluids.
8. **IV Fluids:** IV D5 1/2 NS at 100-200 cc/hr (maintain urine output of 80 mL/h).
9. **Special Medications:**
   -Cefazolin (Ancef) 1-2 gm IV q8h
10. **Symptomatic Medications:**
    -Meperidine (Demerol) 75-100 mg & hydroxyzine 25 mg IM q2-4h prn pain **OR**
    -Hydrocodone/Acetaminophen (Vicodin), 1-2 tab q4-6h PO prn pain **OR**
    -Hydromorphone HCL (Dilaudid) 2-4 mg PO q4-6h prn pain **OR**
    -Acetaminophen with codeine (Tylenol 3) 1-2 tabs PO q3-4h prn pain.
    -Ketorolac (Toradol) 10 mg PO q4-6h prn pain or 30-60 mg IM then 15-30 mg IM q6h (for 5 days max).
    -Zolpidem (Ambien) 10 mg PO qhs.

**Note:** If stone <5 mm without sepsis then discharge home with analgesics and increase PO fluids. If stone >10 mm and/or fever or increased WBC or signs of ureteral dilation, then consider admission of patient with urology consult.

11. **Extras:** IVP, KUB, CXR, ECG.
12. **Labs:** CBC, SMA 6 & 12, calcium, uric acid, phosphorous, UA with micro, urine C&S, urine pH, INR/PTT. Urine cystine (nitroprusside test), send stones for X-ray crystallography. If increased calcium, then check PTH level. 24 hour urine collection for uric acid, calcium, creatinine.
13. **Other Orders and Meds:**

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## Hypercalcemia

1. **Admit to:**
2. **Diagnosis:** Hypercalcemia
3. **Condition:**
4. **Vital signs:** q4h; Call physician if BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C; or tetany or any abnormal mental status.
5. **Activity:** Ambulate as often as possible, in chair at other times.
6. **Nursing:** Seizure precautions, weigh patient bid, I & O.
7. **Diet:** Hypercalcemia - restrict calcium to 400 mg/d, push PO fluids.
8. **Special Medications:**
   -1-4 L of 0.9 % saline over 1-4 hours, then 150-200 cc/h IV until no longer hypotensive **THEN**
   -Saline diuresis 0.9% saline infused at 100-200 cc/h to replace urine loss **AND**
   -Furosemide (Lasix) 20-80 mg IV q4-12h. Maintain urine output of 200 mL/h; monitor I & O, monitor serum Na, K+, Mg.
   -Calcitonin (Calcimar) 4-8 IV 1 kg IM q12h or SQ q6-12h (consider skin test

dose prior to use).
-Discontinue medication associated with increased calcium: Thiazide diuretics, lithium carbonate.

9. **Extras:** CXR, ECG, mammogram.

**10. Labs:** Total & ionized calcium, SMA 7 & 12, phosphate, Mg, alkaline phosphatase, prostate specific antigen. 24h urine calcium, potassium, phosphate. Parathyroid hormone, PTH-related peptide .

## Hyperkalemia

1. **Admit to:**
2. **Diagnosis:** Hyperkalemia
3. **Condition:**
4. **Vital signs:** Vitals, urine output q4h; Call physician if QRS complex >0.14 sec or BP >160/90, <90/60; P >120, <50; R>25, <10; T >38.5°C.
5. **Activity:** Bed rest; up in chair as tolerated.
6. **Nursing:** I&O, daily weights. Chart QRS complex width q1h.
7. **Diet:** Regular, no salt substitutes.
8. **IV Fluids:** D5NS at 150 cc/h
9. **Special Medications:**
   -Consider discontinuing NSAIDS, ACE inhibitors, beta-blockers, K-sparing diuretics.
   -Calcium gluconate 10% sln 10-30 mL IV over 2-5 min; second dose may be given in 5 min. Contraindicated if digoxin toxicity is suspected. Keep 10 mL vial of calcium gluconate at bedside for emergent use.
   -Sodium Bicarbonate 1-3 amps of 7.5% (44-132 mEq) IV over 5 min (give after calcium in separate IV), repeat in 10-15 min. Follow with infusion of 2-3 amps in 500 cc of D5W, titrated over 2-4 h.
   -Insulin 10-20 U regular in 500 mL of 10% dextrose water IV over 1 hr or 10 units IV push with 1 amp 50% glucose (25 gm) over 5 min, repeat as needed.
   -Kayexalate 15-50 gm in 100 mL of 20% sorbitol solution PO now & in 3-4h; up to 4-5 doses/d.
   -Kayexalate retention enema 25-50 gm in 200 mL of 20% sorbitol; retain for 30-60 min.
   -Furosemide 40-80 mg IV qd-bid.
   -Consider emergent dialysis if cardiac complications or renal failure.

**10. Extras:** ECG

**11. Labs:** CBC, platelets, SMA7, Mg, calcium, SMA-12. UA, specific gravity, Na, K. pH, 24h urine K, Na, creatinine. 1, 25-hydroxy vitamin D, 25-hydroxy vitamin D

# Hypokalemia

1. **Admit to:**
2. **Diagnosis:** Hypokalemia
3. **Condition:**
4. **Vital signs:** Vitals, urine output q4h; Call physician if BP >160/90, <90/60; P>120, <50; R>25, <10; T >38.5°C.
5. **Activity:** Bed rest; up in chair as tolerated.
6. **Nursing:** I&O
7. **Diet:** Regular
8. **Special Medications:**

**Acute Therapy:**

-KCL 10-40 mEq in 100 cc saline infused IVPB over 2 hours; or add up to 10-80 mEq to 1 liter of IV fluid and infuse over 2 hours); may combine with 30-40 mEq PO q4h in addition to IV; total dose max is generally 100-200 mEq/d (3 mEq/kg/d).

**Chronic Therapy:**

-KCL elixir 1-3 tablespoon qd-tid PO after meals (20 mEq/Tbsp of 10% sln) **OR**

-Micro-K 10 mEq tabs 2-3 tabs PO tid after meals (40-100 mEq/d) **OR**

-K-Dur 20 mEq tabs 1 PO bid-tid.

**Hypokalemia with metabolic acidosis:**

-Potassium citrate 15-30 mL in juice qid PO after meals (1 mEq/mL).

-Potassium gluconate 15 mL in juice qid PO after meals (20 mEq/15 mL).

9. **Extras:** ECG, dietetics consult.
10. **Labs:** CBC, SMA7, SMA 12. UA, urine Na, K, Cl, pH, 24h urine for K, Na, creatinine.

# Hypermagnesemia

1. **Admit to:**
2. **Diagnosis:** Hypermagnesemia
3. **Condition:**
4. **Vital signs:** q6h; Call physician if QRS >0.14 sec.
5. **Activity:** Up ad lib
6. **Nursing:** I&O, daily weights. Hold all magnesium containing medications, including antacids if hypermagnesemia.
7. **Diet:** Regular
8. **Special Medications:**

-Saline diuresis 0.9% saline infused at 100-200 cc/h to replace urine loss **AND**

-Calcium chloride, 1-3 gms added to saline infusate (10% sln; 1 gm per 10 mL amp) to run at 1 gm/hr **AND**

-Furosemide 20-40 mg IV q4-6h. Monitor I&O q4-6h, serum Ca, Na, K, Mg bid.

-Magnesium of >9.0 requires stat hemodialysis (risk for respiratory failure).

-Pamidronate (Aredia) 60-90 mg in 1 L NS infused over 4h.

**Severe Hypercalcemia:**

(714.0 mg/dL) Mithramycin (Plicamycin) 2.5 u/kg in 500 D5W IV over 4-6h x 1.

9. **Extras:** ECG
10. **Labs:** Magnesium, calcium, SMA 7 & 12. Urine Mg, electrolytes, 24h urine

for Mg, creatinine.

## Hypomagnesemia

1. **Admit to:**
2. **Diagnosis:** Hypomagnesemia
3. **Condition:**
4. **Vital signs:** q6h
5. **Activity:** Up ad lib
6. **Diet:** Regular
7. **Special Medications:**
   -Magnesium sulfate 1-6 gm in 500 mL D5W IV at 1 gm/hr. Hold if no patellar reflex. (Estimation of Mg deficit = 0.2 x kg weight x desired increase in Mg concentration; give deficit over 2-3d) **OR**
   -Magnesium sulfate (severe hypomagnesemia <1.0) 1-2 gm (2-4 mL of 50% sln) IV over 15 min, **OR**
   -Magnesium chloride (Slow-Mag) 65-130 mg (1-2 tabs) PO tid-qid (64 mg or 5.3 mEq/tab) **OR**
   -Milk of magnesia 5 mL PO qd-qid.
8. **Extras:** ECG
9. **Labs:** Magnesium, calcium, SMA 7 & 12. Urine Mg, electrolytes, 24h urine Mg, creatinine.

## Hypernatremia

1. **Admit to:**
2. **Diagnosis:** Hypernatremia
3. **Condition:**
4. **Vital signs:** q2-4h; Call physician if BP >160/90, <70/50; P >140, <50; R>25, <10; T >38.5°C; or any change in neurologic status.
5. **Activity:** Bed rest; up in chair as tolerated.
6. **Nursing:** I&O, daily weights.
7. **Diet:** No added salt
8. **Special Medications:**

**Hypernatremia with Hypovolemia**:
If volume depleted, give 0.5-3 L NS IV at over 1-3 hours until not orthostatic, then give D5W (if hyperosmolar) or D5 1/2 NS (if not hyperosmolar) IV or PO replace half of body water deficit over first 24h (attempt to correct sodium at 1 mEq/L/h), then remaining deficit over next 1-2 days.

$$\text{Body water deficit (L)} = \frac{0.6(\text{weight kg})([\text{Na serum}]-140)}{140}$$

**Hypernatremia with ECF Volume Excess**:
-Salt poor albumin (25%) 50-100 mLs bid-tid x 48-72 h (if low oncotic pressure).
-Furosemide 40-80 mg IV or PO qd-bid.

**Hypernatremia with Diabetes Insipidus:**
-D5W to correct body water deficit (see above).
-Pitressin 5-10 U IM/IV q3-4h, keep urine specific gravity >1.010 **OR**

9. **Extras:** CXR, ECG.
10. **Labs:** SMA 7 & 12, serum osmolality, liver panel, ADH, plasma renin activity. UA, urine specific gravity. Urine osmolality Na, K; 24h urine Na, K, creatinine.

# Hyponatremia

**1. Admit to:**
**2. Diagnosis:** Hyponatremia
**3. Condition:**
**4. Vital signs:** q4h; Call physician if BP >160/90, <70/50; P >140, <50; R>25, <10; T >38.5°C; or any change in neurologic status.
**5. Activity:** Bed rest; up in chair as tolerated.
**6. Nursing:** Seizure precautions, I&O, daily weights.
**7. Diet:** Regular diet.
**8. Special Medications:**

**Hyponatremia with Hypervolemia & Edema** (low osmolality <280, UNa <10 mMol/L: nephrosis, CHF, cirrhosis):
-Water restrict to 0.5-1.0 L/d.
-Furosemide 40-80 mg IV or PO qd-bid.

**Hyponatremia with Normal Volume Status (low osmolality <280, UNa <10 mMol: water intoxication; UNa >20: SIADH, Reset osmostat, diuretic-induced:**
-Water restrict to 0.5-1.5 L/d.

**Hyponatremia with Hypovolemia** (low osmolality <280) UNa <10 mMol/L: vomiting, diarrhea, 3rd space/respiratory/skin loss; UNa >20 mMol/L: diuretics, renal injury, RTA, adrenal insufficiency, partial obstruction, salt wasting:
If volume depleted, give 0.5-3 L of 0.9% saline over 1-3 hours until no longer hypotensive, then 0.9% saline at 65-150 cc/h (determine volume as below) or 100-500 cc 3 % hypertonic saline over 5h.

**Severe Symptomatic Hyponatremia**:
If volume depleted, give 0.5-3 L of 0.9% saline (154 mEq/L) over 1-3 hours until no longer orthostatic.
Determine vol of 3% hypertonic saline (513 mEq/L) to be infused:

Na (mEq) deficit = 0.6 x (wt kg)x(desired [Na] - actual [Na])

$$\frac{\text{Volume of sln (L)}}{\text{Number of hrs}} = \frac{\text{Sodium to be infused (mEq)}}{\text{(mEq/L in sln)} \times \text{Number of hrs}}$$

Correct half of sodium deficit IV slowly over 24 hours until serum sodium is 120 mEq/L; increase sodium by 12-20 mEq/L over 24h (1 mEq/L/h).
-Alternative Method: 3% saline 100-300 cc over 4-6h repeat as needed.

**9. Extras:** CXR, ECG, head/chest CT scan.
**10. Labs:** SMA 7 & 12, osmolality, triglyceride, liver panel. UA, urine specific gravity. Urine osmolality, Na, K.

# Hyperphosphatemia

**1. Admit to:**
**2. Diagnosis:** Hyperphosphatemia
**3. Condition:**
**4. Vital signs:** qid
**5. Activity:** Up ad lib
**6. Nursing:** I&O

**7. Diet:** Restrict phosphorus to 0.7-1 gm/d
**8. IV Fluids:** see below.
**9. Special Medications:**
**Moderate Hyperphosphatemia:**
-Restrict dietary phosphate to 0.6-0.9 gm/d.
-Aluminum hydroxide (Amphojel) 5-10 mL or 1-2 tablets PO before meals tid
**OR**
-Aluminum carbonate (Basaljel) 5-10 mL or 1-2 tablets PO before meals tid.
**Severe Hyperphosphatemia:**
-Volume expansion with 0.9% saline 1-3 L over 1-3h.
-Acetazolamide (Diamox) 500 mg PO or IV q6h.
-Consider dialysis.
**10. Extras:** CXR PA & LAT, ECG.
**11. Labs:** Phosphate, SMA 7 & 12, Mg, Cal, urine electrolytes, pH. UA, PTH.

## Hypophosphatemia

**1. Admit to:**
**2. Diagnosis:** Hypophosphatemia
**3. Condition:**
**4. Vital signs:** qid
**5. Activity:** Up ad lib
**6. Nursing:** I&O.
**7. Diet:** Regular diet.
**8. IV Fluids:** see below.
**9. Special Medications:**
**Mild Hypophosphatemia (1.0-2.5 mg/dL):**
-Neutral phosphate (Nutra-Phos), 2 tab PO bid-tid (250 mg elemental phosphorus/tab) **OR**
-Phospho-Soda 5 mL (129 mg phosphorus)PO bid-tid.
**Severe Hypophosphatemia (<1.0 mg/dL):**
-Na or K phosphate 0.5 mMoles/kg in 250 mLs D5W or NS, IV infusion at 10 mMoles/hr.
-Add potassium phosphate to IV solution in place of KCL (max 40 mEq/L infused at 100-150 mL/h); max IV dose 7.5 mg phosphorus/kg/6-8h.
**10. Extras:** CXR PA & LAT, ECG.
**11. Labs:** Phosphate, SMA 7 & 12, Mg, Cal, urine electrolytes, pH. UA.
**12. Other Orders and Meds:**

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# *Rheumatology*

## Acute Gout Attack

**1. Admit to:**
**2. Diagnosis:** Acute gout attack
**3. Condition:**
**4. Vital signs:** qid
**5. Activity:** Bed rest with bedside commode
**6. Nursing:** Keep foot elevated with support sheets over foot; guaiac stools.
**7. Diet:** Low purine diet.
**8. Special Medications:**
-Indomethacin (Indocin) 25-50 mg PO q6h x 2d, then 50 mg tid for 2 days, then 25 mg PO tid **OR**
-Ketorolac (Toradol) 30-60 mg IM, then 15-30 mg IM q6h or 10 mg PO tid-qid. **OR**
-Ibuprofen (Motrin) 800 mg, then 400-800 mg PO q4-6h **OR**
-Naproxen sodium (Anaprox, Anaprox-DS) 550 mg PO bid.
-Colchicine 2 tablets (0.5 mg or 0.6 mg) followed by 1 tablet q1h until relief, max dose of 9.6 mg/24h. Then give maintenance colchicine 0.5-0.6 mg PO qd-bid **OR**
-Methylprednisolone (SoluMedrol) 125 mg IV x 1 dose **THEN**
-Prednisone 40-60 mg PO qd x 5 days, followed by tapering **OR**
-Adrenocorticotrophic hormone (ACTH) 40 units SQ q8-12h.
-Intra-articular injection with lidocaine/Marcaine and triamcinolone.

**Hypouricemic Therapy:**
-Hypouricemic drugs are contraindicated during an acute attack unless patient was previously taking them.
-Allopurinol 300 mg PO qd, may increase by 100-300 mg q2weeks.
-Probenecid (Benemid), 250 mg bid. Increase the dosage to 500 mg bid after 1 week, then increase by 500-mg increments every 4 weeks while monitoring the serum uric acid level, which should be maintained below 6.5 mg/dL. Max dose 2 g/d; average maintenance dosage is 500 mg bid.

**9. Symptomatic Medications:**
-Ranitidine (Zantac) 150 mg PO bid.
-Meperidine (Demerol) 50-100 mg IM/IV q4-6h prn pain.

**10. Labs:** CBC, SMA 7, uric acid, ESR. UA with micro. Synovial fluid for light and polarizing micrography for crystals; C&S, Gram stain, glucose, protein, cell count, pH. X-ray views of joint. 24 hour urine for uric acid, creatinine.
**11. Other Orders and Meds:**

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# PEDIATRICS

# *General Pediatrics*

## Pediatric History and Physical Examination

**Chief Complaint:**
**History of Present Illness:**
**Past Medical History:**
**Medications:**
**Feedings:**
**Immunizations:**
**Birth History:**
**Developmental History:**
**Family History:**
**Social History:**
**Allergies:**
**Physical Exam:**
**Assessment and Plan:**

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## Developmental Milestones

| Age | Milestone |
|---|---|
| **1 month** | Raises head slightly when prone; alerts to sound; regards face, moves extremities equally. |
| **2-3 months** | Smiles, holds head up, coos, reaches for familiar objects; recognizes parent. |
| **4-5 months** | Rolls front to back and back to front; sits well when propped; laughs, orients to voice; enjoys looking around surroundings; grasps rattle, bears some weight on legs. |
| **6 months** | Sits unsupported; stranger anxiety; passes cube hand to hand; babbles; uses raking grasp; feeds self crackers. |
| **8-9 months** | Crawls, cruises; pulls to stand; pincer grasp; plays pat-a-cake; feeds self with bottle; sits without support; explores environment. |
| **12 months** | Walking, talking a few words; understands "no"; says "mama/dada" discriminantly; throws objects; imitates actions, marks with crayon, drinks from a cup. |
| **15-18 months** | Comes when called; scribbles; walks backward; uses 4-20 words; builds tower of 2 blocks. |
| **24-30** | Removes shoes; follows 2 step command; jumps with |

| | |
|---|---|
| **3 years** | Dresses and undresses; walks up and down steps; draws a circle; knows more than 250 words; takes turns; shares. Group play. |
| **4 years** | Hops, skips, catches ball; memorizes songs; plays cooperatively; knows colors; copies a circle; uses plurals. |
| **5 years** | Jumps over objects; prints first name; knows address and mother's name; tolerates separation; follows game rules; draws three part man; hops on one foot. |

**Note:** Premature infants must be age corrected for their prematurity prior to testing.

# Immunization

**Recommended Schedule for Immunization of Healthy Infants and Children**

| Age | Immunizations | Comments |
|---|---|---|
| Birth | HBV | |
| 1-2 mo | HBV | |
| 2 mo | DTP, Hib, inactive polio vaccine | DTP and Hib are available combined as Tetramune. |
| 4 mo | DTP, Hib, inactive polio vaccine | |
| 6 mo | DTP, Hib | Dose 3 of Hib is not indicated if the product for doses 1 and 2 was PedvaxHIB. |
| 6-18 mo | HBV | |
| 12-15 mo | Hib, MMR, VAR | Tuberculin testing may be done at the same visit if indicated. Oral polio vaccine may be given instead of inactivated polio vaccine and is given at 12-18 months and 4-6 years |
| 15-18 mo | DTaP or DTP | The 4th dose of DTP should be given 6-12 mo after third dose of DTP and may be given as early as 12 mo, provided that the interval between doses 3 and 4 is at least 6 mo. |
| 4-6 y | DTaP or DTP | DTaP or DTP should be given at or before school entry. DTP or DTaP should not be given after the 7th birthday |
| 11-12 y | MMR | MMR should be given at entry to middle school or junior high school |
| 14-16 y | Td | Repeat every 10 yrs throughout life |

HBV = Hepatitis B virus vaccine; DTP = diphtheria and tetanus toxoids and pertussis vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; Hib = Haemophilus influenzae type b conjugate vaccine; OPV = oral poliovirus vaccine (attenuated); MMR = live measles, mumps, and rubella viruses vaccine; Td = adult tetanus toxoid (full dose) and diphtheria toxoid (reduced dose), for children >7 y and adults; VAR = varicella virus vaccine

**Recommended Schedule for Children Younger than 7 Years Not Immunized in the First Year of Life**

| Age | Immunizations | Comments |
|---|---|---|
| **First visit** | DTP, Hib, HBV<br>MMR, inactivated polio vaccine, VAR | If indicated, tuberculin testing may be done at the same visit.<br>If child is ≥5 years, Hib is not indicated. |
| **Interval after 1st visit**<br>1 month<br>2 months<br>≥8 months | <br>DTP, HBV<br>DTP, Hib, inactivated polio vaccine<br>DTP or DTaP, HBV | <br>Second dose of Hib is indicated only if first dose was received when <15 months. |
| **4-6 years** (at or before school entry) | DTP or DTaP | DTP or DTaP is not necessary if the fourth dose was given after the fourth birthday. OPV is not necessary if the third dose was given after the fourth birthday. |
| **11-12 y** | MMR | MMR should be given at entry to middle school or junior high school |
| **10 y later** | Td | Repeat every 10 yrs |

**Recommended Schedule for Children >7 Years Who Were Not Immunized Previously**

| Age | Immunizations | Comments |
|---|---|---|
| **First visit** | HBV, inactivated polio vaccine, MMR, Td, VAR | |
| **Interval after First visit**<br>2 months<br><br>8-14 months | <br>HBV, inactivated polio vaccine, Td<br>HBV, Td | |
| **Back to age**<br>11-12 y | <br>MMR | |
| 10 y later | Td | Repeat every 10 years |

# Haemophilus Immunization

**Recommendations for H influenzae type b Vaccination in Children Immunized Beginning at 2 to 6 Months of Age**

| Vaccine Product | Total Number of Doses | Regimens |
|---|---|---|
| PedvaxHIB | 3 | 2 doses two months apart plus booster at 12 months which must be at least two months after previous dose |
| HibTITER | 4 | 3 doses two months apart plus booster at 15 months which must be at least two months after previous dose |

**Recommendations for H influenzae type b Vaccination in Children in Whom Initial Vaccination was Delayed Until 7 Months of Age or Older**

| Age at Initiation | Vaccine Product | Total Doses | Regimens |
|---|---|---|---|
| 7-11 mo | PedvaxHIB or HibTITER | 3 | 2 doses at 2 months intervals plus booster at 15 months (at least 2 months after previous dose) |
| 12-14 mo | PedvaxHIB or HibTITER | 2 | 2 doses 2 months apart |
| 15-59 mo | PedvaxHIB or HibTITER or ProHIBit | 1 | Single dose of any product |
| ≥5 years | Immunization not recommended for this age group. | | |

# Varicella Immunization

**Recommended for:**

- All children between 12-18 mo of age
- All adolescents aged 11-12 years who have not previously received the vaccine or have not had a documented case of chicken pox
- All susceptible children age of 18 years or younger who are in direct contact with people at high risk for varicella related complications (e.g., immunocompromised individuals).

# *Pediatric Symptomatic Care*

## Antipyretics

**Definition of Fever:**

| | |
|---|---|
| Rectal Temperature | >38 degrees Celsius |
| Oral Temperature | >37.5 degrees Celsius |
| Axillary Temperature | >37 degrees Celsius |
| Tympanic Temperature | ≥37 degrees Celsius |

**Analgesics/Antipyretics:**

-Acetaminophen (Tylenol) 10-20 mg/kg/dose PO/PR q4-6h, max 5 doses/day or 80 mg/kg/day or 4 gm/day (whichever is smaller) **OR**

-Acetaminophen dose by age (if weight appropriate for age):

| **AGE:** | **Mg/Dose PO q4-6h:** |
|---|---|
| 0-3 mo | 40 mg/dose |
| 4-11 mo | 80 mg/dose |
| 1-2 yr | 120 mg/dose |
| 2-3 yr | 160 mg/dose |
| 4-5 yr | 240 mg/dose |
| 6-8 yr | 320 mg/dose |
| 9-10 yr | 400 mg/dose |
| 11-12 yr | 480 mg/dose |
| >12 yr | 325-650 mg/dose |

-Preparations: Tabs: 325, 500 mg; chewable tabs: 80 mg; caplets: 160 mg, 500 mg; drops: 80 mg/0.8 ml; elixir: 120 mg/5 ml, 130 mg/5 ml, 160 mg/5 ml, 325 mg/5 ml; caplet, ER: 650 mg; suppositories: 120,325,650 mg.

-Ibuprofen (Motrin, Advil, Nuprin, Medipren, Children's Motrin), antipyretic: 5-10 mg/kg/dose PO q6-8h. [suspension: 100 mg/5 ml, tabs: 200, 300, 400, 600, 800 mg]. May cause GI distress, bleeding.

## Antitussives and Decongestants

**Antitussives (Pure)**:

-Guaifenesin (Robitussin), expectorant: [syrup: 100 mg/5 ml]
<2 y: 12 mg/kg/day PO q4-6h prn
2-6 yr: 50-100 mg PO q4h prn (max 600 mg/day)
6-12 yr: 100-200 mg PO q4h prn (max 1.2 g/day)
>12 yr: 100-400 mg PO q4h prn (max 2.4 g/day)
May irritate gastric mucosa; take with large quantities of fluids.

**Decongestants**:

-Pseudoephedrine (Sudafed, Novafed): [Tabs: 30, 60 mg; sustained release caps: 120 mg; syrup: 15 mg/5 ml, 30 mg/5 ml; drops: 7.5 mg/0.8 ml]
Children <12 yr: 4 mg/kg/day PO q6h
Children >12 yr and adults: 30-60 mg/dose PO q6-8h or sustained release 120 mg PO q12h.

**Combination Antihistamine/Decongestant/Antitussives**:

-Actifed OTC [per tab or 10 ml syrup: Triprolidine 2.5 mg, Pseudoephedrine 60 mg]

4 mth-2 y: 1.25 ml PO q6-8h
2-4 y: 2.5 ml PO q6-8h
4-6 y: 3.75 ml PO q6-8h
6-12y: 5 ml PO q6-8h
>12 y: 10 ml PO q6-8h **OR**
4 mg pseudoephedrine/kg/day PO tid-qid

-Actifed with Codeine cough syrup [syrup per 5 ml: Codeine 10 mg, Triprolidine 1.25 mg, Pseudoephedrine 30 mg/5 ml]
4 mth-2 y: 1.25 ml PO q6-8h
2-4 y: 2.5 ml PO q6-8h
4-6 y: 3.75 ml PO q6-8h
6-12y: 5 ml PO q6-8h
>12 y: 10 ml PO q6-8h **OR**
4 mg pseudoephedrine/kg/day PO tid-qid

-Benylin DM Cough Syrup [syrup per 5 ml: Dextromethorphan 10 mg]
2-6 y: 2.5-5 mg PO q4h prn or 7.5 mg PO q6-8h prn
6-11 y 5-10 mg PO q4h prn or 15 mg PO q6-8h prn
≥12 y: 10-20 mg PO q4h prn or 30 mg PO q6-8h prn.

-Dimetane [elixir OTC: brompheniramine 2 mg/5 ml; tab: 4 mg; SR tab: 8 mg, 12 mg]
0.5 mg/kg/day PO q6h prn
6-12 y: 2-4 mg PO q6-8h
>12 y: 4-8 mg PO q4-6h or 8 mg SR PO q8-12h or 12 mg SR PO q12h (max 24 mg/day).

-Dimetapp [elixir per 5 ml: Brompheniramine 2 mg, Phenylpropanolamine 12.5 mg; tab: Brompheniramine 4 mg, Phenylpropanolamine 25 mg; SR tab: Brompheniramine 12 mg, Phenylpropanolamine 75 mg]
1-6 mth: 1.25 ml PO q6-8h
7-24 m: 2.5 ml PO q6-8h
2-4 y: 3.75 ml PO q6-8h
4-11 y: 5 ml PO q6-8h
≥12 y: 5-10 ml PO q6-8h or 0.5 mg/kg/day of brompheniramine component PO q6-8h.

-Entex LA [SR tab: Phenylpropanolamine 75 mg, guaifenesin 400 mg]
>12 y: 1 tab PO bid

-Entex [liquid per 5 ml: Phenylpropanolamine 20 mg, Phenylephrine 5 mg, guaifenesin 100 mg]
2-4 y: 2.5 ml PO q6h prn
4-6 y: 5 ml PO q6h prn
6-12 y: 7.5 ml PO q6h prn
≥12 y: 10 ml PO q6h prn

-PediaCare Cold Allergy Chewable Tablets: [pseudoephedrine 15 mg, chlorpheniramine 1 mg]
6-11 y: 2 tabs PO q4-6h (max 8 tabs/day)
>12 y: 4 tabs PO q4-6h (max 16 tabs/day)

-PediaCare Night Rest Cough-Cold Liquid [per 5 ml: Pseudoephedrine 15 mg, Chlorpheniramine 1 mg, Dextromethorphan 7.5 mg]
6-11 y: 10 ml PO q6-8h prn
>12 y: 20 ml PO q6-8h prn

-PediaCare Cough-Cold Liquid [per 5 ml: Pseudoephedrine 15 mg, Chlorpheniramine 1 mg, Dextromethorphan 5 mg]
6-11 y: 10 ml PO q6-8h prn
>12 y: 20 ml PO q6-8h prn

-PediaCare I Children's Cough Relief Liquid [per 5 ml: Dextromethorphan 5

mg/5]
2-5 y: 2.5-5 mg PO q4h prn or 7.5 mg PO q6-8h prn;
6-11 y: 5-10 mg PO q4h prn or 15 mg PO q6-8h prn;
≥12 y: 10-20 mg PO q4h prn or 30 mg PO q6-8h prn.
-PediaCare 3 Children's Cold Relief Liquid [per 5 ml: Dextromethorphan 5 mg, chlorpheniramine 1 mg, pseudoephedrine 15 mg]
4-5 mg/kg/day of pseudoephedrine component PO q6h prn.
-Phenergan with Codeine [per 5 ml: Promethazine 6.25 mg, Codeine 10 mg, phenylephrine 5 mg]
2-6 y: 1.25-2.5 ml PO q4-6h prn
6-12 y: 2.5 ml PO q4-6h prn
>12 y: 5 ml PO q4-6h prn
Adults: 5-10 ml q4-6h prn (max 120 mg codeine per day)
-Phenergan with Dextromethorphan [per 5 ml: Promethazine 6.25 mg, Dextromethorphan 15 mg]
2-6 y: 1.25 ml PO q4-6h prn
6-12 y: 2.5 ml PO q4-6h prn
>12 y: 5 ml PO q4-6h prn
-Phenylephrine nasal drops [Neo-Synephrine) 1/8, ¼, ½, 1%; or nasal spray: ¼, ½, 1%]
Infants: Use 1/8 % drops, 1-2 drops in each nostril q3-4h
Children: Use ¼ % spray or drops, 1-2 drops/spray in each nostril q3-4h
Adults: Use ¼-1% drops/spray, 1-2 drops/sprays in each nostril q3-4h
Discontinue use after 3 days to avoid rebound congestion.
-Polyhistine DM [per 5 ml: Phenylpropanolamine 12.5 mg, Brompheniramine 2 mg, Dextromethorphan 10 mg]
1-6 mos: 1.25 ml PO tid-qid prn
7-24 mos: 2.5 ml PO tid-qid prn
2-4 y: 3.75 ml PO tid-qid prn
4-12 y: 5 ml PO tid-qid prn
>12 y: 10 ml PO tid-qid prn.
-Polyhistine CS [per 5 ml: Phenylpropanolamine 12.5 mg, Brompheniramine 2 mg, Codeine 10 mg]
1-6 mos: 1.25 ml PO tid-qid prn
7-24 mos: 2.5 ml PO tid-qid prn
2-4 y: 3.75 ml PO tid-qid prn
4-12: 5 ml PO tid-qid prn
>12 y: 10 ml PO tid-qid prn.
-Robitussin AC [per 5 ml: Guaifenesin 100 mg, Codeine 10 mg]
2-6 yrs: 2.5 ml PO q4h prn
6-12 yrs: 5 ml PO q4h prn
≥12 yrs: 10 ml PO q4-6h prn.
-Robitussin CF [per 5 ml: Guaifenesin 100 mg, Dextromethorphan 10 mg, Phenylpropanolamine 12.5 mg]
2-6 yrs: 2.5 ml PO q4h prn
6-12 yrs: 5 ml PO q4h prn
≥12 yrs: 10 ml PO q4-6h prn.
-Robitussin DM [per 5 ml: Guaifenesin 100 mg, Dextromethorphan 15 mg]:
2-6 y: 2.5-5 ml PO q4h prn, max 10 ml/day
6-11 y: 5-10 ml PO q4h prn, max 20 ml/day
≥12 y: 10-20 ml PO q4h prn, max 40 ml/day.
-Rondec drops [per 1 ml: carbinoxamine maleate 2 mg, pseudoephedrine 25 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn; **OR**

1-3 m: ¼ dropperful (¼ ml) PO q6h prn
3-6 m: ½ dropperful (½ ml) PO q6h prn
6-9 m: 3/4 dropperful (0.75 ml) PO q6h prn
9-18 m: 1 dropperful (1 ml) PO q6h prn.

-Rondec syrup [per 5 ml: Pseudoephedrine 60 mg, carbinoxamine 4 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn.

-Rondec DM drops [per ml: carbinoxamine maleate 2 mg, pseudoephedrine 25 mg, dextromethorphan 4 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn **OR**
1-3 m: ¼ dropperful (¼ ml) PO q6h prn
3-6 m: ½ dropperful (½ ml) PO q6h prn
6-9 m: 3/4 dropperful (0.75 ml) PO q6h prn
9-18 m: 1 dropperful (1 ml) PO q6h prn.

-Rondec DM syrup [per 5 ml: Carbinoxamine 4 mg, pseudoephedrine 60 mg, dextromethorphan 15 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn.

-Sudafed Plus [per 5 ml: pseudoephedrine 30 mg, chlorpheniramine 2 mg; tab: pseudoephedrine 60 mg, chlorpheniramine 4 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn.

-Sudafed Cough Syrup [per 5 ml: Dextromethorphan 5 mg, guaifenesin 100 mg, pseudoephedrine 15 mg]
4-5 mg pseudoephedrine/kg/day PO q6h prn.

# Analgesia and Sedation

**Analgesics:**

-Acetaminophen/Codeine [per 5 ml: Acetaminophen 120 mg and Codeine 12 mg; or tabs Tylenol #2: 15 mg codeine/300 mg acetaminophen; #3: 30 mg codeine/300 mg acetaminophen; #4: 60 mg codeine/300 mg acetaminophen]
0.5-1.0 mg codeine/kg/dose PO q4h prn.

-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn

-Acetaminophen/Hydrocodone [elixir per 5 ml: hydrocodone 2.5 mg, acetaminophen 167 mg]
Tab:
Hydrocodone 2.5 mg, acetaminophen 500 mg
Hydrocodone 5 mg, acetaminophen 500 mg
Hydrocodone 7.5 mg, acetaminophen 500 mg
Children: 0.6 mg hydrocodone/kg/day PO q6-8h prn
<2 y: do not exceed 1.25 mg/dose
2-12 y: do not exceed 5 mg/dose
>12 y: do not exceed 10 mg/dose

-EMLA cream (eutectic mixture of local anesthetics) [5 gm, 30 gm: 2.5% lidocaine and 2.5% prilocaine]. Apply and cover with occlusive dressing at least 1 hour (max 4 hours) prior to procedure (e.g. lumbar puncture, venipuncture, marrow aspiration).

-Fentanyl 1-2 mcg/kg IV q1-2h prn or 1-3 mcg/kg/hr continuous IV infusion.

-Hydromorphone (Dilaudid) 0.015 mg/kg IV/IM/SC q3-4h or
0.0075 mg/kg/hr continuous IV infusion titrated as necessary for pain relief or 0.03-0.08 mg/kg PO q6h prn.

-Ibuprofen (Children's Motrin, PediaProfen) [100 mg/5 ml; tabs 200, 300, 400, 600, 800 mg]
>6 mth: 5-10 mg/kg/dose PO q6-8h

-Ketamine 4 mg/kg IM; 0.5-1 mg/kg IV
Comment: Onset is approximately 30 seconds, duration is approximately 5-15 minutes.

-Meperidine (Demerol) 1 mg/kg IV/IM q2-3h prn.

-Morphine 0.05-0.1 mg/kg IV q2-4h prn or 0.02-0.06 mg/kg/hr continuous IV infusion; or 0.1-0.15 mg/kg IM/SC q3-4h.

**Sedation:**

**DPT Cocktail:**

-Meperidine (Demerol) 1-2 mg/kg IM **AND**

-Promethazine (Phenergan) 0.5-1 mg/kg IM **AND**

-Chlorpromazine (Thorazine) 0.5-1 mg/kg IM.

Extremely variable effect, onset, and duration of action. All three drugs may be mixed together in one syringe and administered as a single IM injection.

**Fentanyl and Midazolam Sedation:**

-Fentanyl 1 mcg/kg IV slowly, may repeat to total of 3 mcg/kg **AND**

-Midazolam (Versed) 0.05-0.1 mg/kg slow IV [inj 1 mg/ml, 5 mg/ml].

Naloxone and flumazenil should be readily available for reversal if necessary.

**Other Sedatives:**

-Lorazepam (Ativan) 0.05-0.10 mg/kg/dose IM/IV/PO, max 4 mg.

-Diazepam (Valium) 0.2-0.5 mg/kg/dose PO/PR or 0.05-0.2 mg/kg/dose IM/IV, max 10 mg.

>1 $m^2$: 4 mg PO three times daily **OR**
4-11 y: 4 mg PO three times daily
>11 y: 8 mg PO three times daily
[inj: 2 mg/ml; tab: 4, 8 mg]

Comment: Injectable solution may be given as an oral liquid.

-Dexamethasone
10 mg/$m^2$/dose (max 20 mg) IV x 1, then 5 mg/$m^2$/dose (max 10 mg) IV q6h prn
[inj: 4 mg/ml, 10 mg/ml]

-Granisetron (Kytril)
10-20 mcg/kg IV given just prior to chemotherapy (single dose) [inj: 1 mg/ml]
Adults (oral) 1 mg PO bid.

-Metoclopramide (Reglan)
1 mg/kg/dose IV q4h prn.
Pretreatment with diphenhydramine 1 mg/kg IV is recommended to decrease the risk of extrapyramidal reactions.
[inj: 5 mg/ml]

-Dronabinol (Marinol)
5 mg/$m^2$/dose PO 1-3 hrs prior to chemotherapy then q4h prn afterwards. May titrate up in 2.5 mg/$m^2$/dose increments to max of 15 mg/$m^2$/dose.
[cap: 2.5, 5, 10 mg]

# *Cardiology*

## Pediatric Advanced Life Support

**General Measures:**

Begin CPR, 100% oxygen, assess rhythm and pulse. Assess airway, breathing, and circulation; consider nasogastric tube if supportive ventilation required for longer than 2 min.

**Intubation:**

| Age: | ETT | Laryngoscope Blade | NG Tube Size |
|---|---|---|---|
| Premature | 2.0-2.5 | 0 | 8 |
| Newborn >2 kg | 3.0-3.5 | 1 | 10 |
| Infant | 3.5-4.0 | 1 | 10 |
| 12 mo | 4.0-4.5 | 1.5 | 12 |
| 36 mo | 4.5-5.0 | 2 | 12-14 |
| 6 yr | 5.0-5.5 | 2 | 14-16 |
| 10 yr | 6.0-6.5 | 2 | 16-18 |
| Adolescent | 7.0-7.5 | 3 | 18-20 |
| Adult | 7.5-8.0 | 3 | 20 |

Uncuffed ET tube in children <8 yrs.

Straight laryngoscope blade if <6-10 yrs; curved blade if older.

10. **Preoxygenate** with 100% oxygen via air bag and mask.
11. **Atropine** 0.02 mg/kg IV or ET (min 0.1 mg; max 0.5 mg for child, max 1 mg for adolescent).
12. **Lorazepam (Ativan)** 0.1 mg/kg IV/IM (max 4 mg) **OR**
    **Diazepam (Valium)** 0.2-0.5 mg/kg IV/IM (max 10 mg) **OR**
    **Midazolam (Versed)** 0.1 mg/kg IV/IM (max 5 mg)
13. **Succinylcholine** 1-2 mg/kg IV (max 100 mg) or 2-4 mg/kg IM (max 150 mg) **OR**
    **Pancuronium:** 0.06-0.1 mg/kg/dose IV **OR**
    **Vecuronium** 0.1 mg/kg IV

**Supraventricular Tachycardia:**

1. **Mild to Moderate Severity:** Apply vagal stimulation by neck extension (no direct pressure on carotid) or ice bag to face for 15-20 seconds. If no conversion, give Adenosine 0.1 mg/kg (max 6 mg) rapid IV push with EKG monitoring. May double dose once to 0.2 mg/kg (max 12 mg) and repeat every 2 minutes prn until termination of SVT.
2. **Severe (Patients who show evidence of cardiovascular compromise): Synchronized DC cardiovert with 0.5 J/kg**. If conversion to sinus rhythm does not occur, synchronized cardiovert with 1 J/kg.
3. **Maintain oxygenation and ventilation.**

**Asystole:**

1. Start CPR, and confirm asystole with 2 leads. Secure airway. Hyperventilate with 100% oxygen.
2. **Epinephrine** 0.01 mg/kg (0.1 ml/kg of 0.1 mg/ml = 1:10,000) IV/IO. If pulseless cardiac arrest persists, a second dose of 0.1 mg/kg (0.1 ml/kg of 1 mg/ml = 1:1000) is given. If a response to the first 0.01 mg/kg dose occurs, repeat same dose q3-5 minutes. Consider starting continuous infusion of 0.05-1 mcg/kg/min. For endotracheal route, give 0.1 mg/kg (0.1 ml/kg of 1 mg/ml = 1:1000) diluted with normal saline to final volume of 3-5 ml. Repeat q3-5 min.
3. Consider **External or Transvenous Pacing,** and consider **Bicarbonate** for suspected or proven acidosis, 1 mEq/kg IV/IO [1 mEq/ml sln diluted 1:1 with sterile water].

**Sinus Bradycardia:**

Rate <60 BPM with poor perfusion, even if BP is normal; Initiate 100% oxygen, chest compressions.

1. **Epinephrine** 0.01 mg/kg (0.1 ml/kg of 0.1 mg/ml = 1:10,000) IV/IO q5min, then consider 0.05-1 mcg/kg/min continuous IV infusion. For endotracheal route, 0.1 mg/kg (0.1 mg/ml of 1 mg/ml = 1:1000) diluted with normal saline to final volume of 3-5 ml.
2. **Atropine** 0.02 mg/kg (0.2 ml/kg of 0.1 mg/ml = 1:10,000) IV/IO q5 minutes (minimum 0.1 mg; maximum 0.5 mg for child, 1 mg for adolescent). For endotracheal use, use 0.04-0.06 mg/kg (0.4-0.6 ml/kg of 0.1 mg/ml = 1:10,000) diluted with normal saline to final volume of 3-5 ml.
3. **Isoproterenol** 0.05-1.5 mcg/kg/min continuous IV infusion, begin with 0.05 mcg/kg/min and increase every 5-10 min by 0.05-0.1 mcg/kg/min until desired effect or tachycardia > 180 bpm or arrhythmia occurs. Max dose: 2 mcg/kg/min. For use in bradycardia due to heart block only
4. **External or Esophageal Pacing**

**Ventricular Fibrillation or Pulseless Ventricular Tachycardia:**

1. Ventilation with 100% oxygen. Chest compression should be initiated. Defibrillation should not be delayed.
2. Defibrillate with **unsynchronized 2 Joules/kg**. If necessary double to 4 Joules/kg and defibrillate two more times.
3. **Epinephrine:** First dose 0.01 mg/kg (0.1 ml/kg of 0.1 mg/ml = 1:10,000) IV/IO q 3-5 min. For endotracheal route, 0.1 mg/kg (0.1 mg/ml of 1 mg/ml = 1:1000) diluted with normal saline to final volume of 3-5 ml. Second and subsequent doses 0.1 mg/kg (0.1 ml/kg of 1 mg/ml = 1:1000) IV/IO/ET.
4. **Defibrillate** with unsynchronized 4 Joules/kg 30-60 seconds after each medication.
5. **Lidocaine** 1 mg/kg IV/IO bolus, may repeat bolus x 1, then consider 10-50 mcg/kg/min continuous IV infusion.
6. **Defibrillate.**
7. **Bretylium** 5 mg/kg first dose IV, 10 mg/kg second dose IV.
   a. **Defibrillate** after each dose with unsynchronized 4 joules/kg.

**Unstable Ventricular Tachycardia with Pulse:**

1. Intubate and ventilate with 100% oxygen, and sedate patient if time permits (midazolam 0.1 mg/kg IV).
2. If it will not delay cardioversion, administer lidocaine 1 mg/kg IV.

3. Cardiovert with **Synchronized 0.5 Joules/kg**, may repeat with 1 J/kg.
4. **Lidocaine** 1 mg/kg IV bolus (max 100 mg), then 20-50 mcg/kg/min continuous infusion IV. Administer bolus prior to cardioversion if time permits.
5. If no conversion, **Cardiovert Synchronized*** at 1 J/kg, or if **recurrent ventricular tachycardia**, **Cardiovert** again starting at previously successful energy level.
6. **Bretylium** 5 mg/kg (max 500 mg) rapid IV over 1-2min, may double dose and repeat in 20 min.

***If unconscious, pulmonary edema, hypotensive, use unsynchronized cardioversion and bypass sedation.**

1. Synchronized cardioversion is indicated. If clinical condition permits, secure vascular access and give lidocaine 1 mg/kg IV. Do not delay cardioversion in an unstable child.
2. Consider lidocaine infusion if ventricular arrhythmias are thought to be associated with myocarditis or structural heart disease.
3. Consider bretylium if defibrillation and lidocaine are ineffective.

**Stable Ventricular Tachycardia with Pulse:**

1. **Lidocaine** 1 mg/kg (max 100 mg) IV, then 20-50 mcg/kg/min continuous infusion IV **OR**
2. **Procainamide** 3-6 mg/kg slow IV, may repeat to max 15 mg/kg or 100 mg; infusion: 20-80 mcg/kg/min IV.
3. If no conversion, or if chest pain, dyspnea, or MI, use synchronized cardioversion as in unstable ventricular tachycardia.

**Post Arrest Stabilization:**

-Epinephrine 0.05-1 mcg/kg/min continuous IV infusion.
-Dopamine 2-20 mcg/kg/min continuous IV infusion.
-Dobutamine 2-20 mcg/kg/min continuous IV infusion.

## Congestive Heart Failure

1. **Admit to:**
2. **Diagnosis:** Congestive Heart Failure
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Daily weights, inputs and outputs
7. **Diet:** Low salt diet
8. **IV Fluids:**
9. **Special Medications:**

-Oxygen 2-4 L/min by NC.
-Furosemide (Lasix) 1 mg/kg/dose (usual max 80 mg PO, 40 mg IV) IV/IM/PO q6-12h prn, may increase to 2 mg/kg/dose IV/IM/PO [tabs: 20, 40, 80 mg; inj: 10 mg/ml; oral liquid: 10 mg/ml, 40 mg/5 ml] **OR**
-Bumetanide (Bumex) 0.015-0.1 mg/kg PO/IV/IM q24h (max 10 mg/day) [tabs: 0.5, 1, 2 mg; inj: 0.25 mg/ml].

**Digoxin:**

Before administration: baseline ECG, serum electrolytes (particularly potassium), estimation of renal function
Initial digitalization establishes the body stores, and is given over 24 hours in

three divided doses: ½ TDD at time 0 hours, 1/4 TDD in 8-12 hours, and 1/4 TDD 8-12 hours later (TDD is total digitalizing dose).

Maintenance therapy is then started.

**Total Digitalizing Dose**

| | PO | IV |
|---|---|---|
| Premature infant | 15-40 mcg/kg | 10-30 mcg/kg |
| Full term newborn (0-2 weeks) | 30 mcg/kg | 20-25 mcg/kg |
| 2 wks-2 y | 40-50 mcg/kg | 30-40 mcg/kg |
| 2-10 y | 30-40 mcg/kg | 25-30 mcg/kg |
| >10 y | 1.5-2 mg | 10 mcg/kg (max 1 mg) |

**Maintenance digoxin dose**

| | PO | IV |
|---|---|---|
| Preterm neonate | 4-12 mcg/kg/day | 4-9 mcg/kg/day |
| Term neonate (0-2 wks) | 8-10 mcg/kg/day | 6-8 mcg/kg/day |
| 2 weeks - 2 y | 10-12 mcg/kg/day | 8-10 mcg/kg/day |
| 2-10 y | 8-10 mcg/kg/day | 6-8 mcg/kg/day |
| >10 y | 5 mcg/kg/day | 2-3 mcg/kg/day |
| Adult | 0.125-0.5 mg/day | 0.1-0.4 mg/day |

[caps: 50, 100, 200 mcg; tabs: 0.125, 0.250, 0.500 mg; oral elixir: 50 mcg/ml; inj: 100, 250 mcg/ml].

Divide bid if <10 yrs or qd if ≥10 yrs.

**Other Inotropic Agents:**

-Dopamine 2-20 mcg/kg/min continuous IV infusion, titrate cardiac output and BP.

-Dobutamine 2-20 mcg/kg/min continuous IV infusion, max of 40 mcg/kg/min.

-Nitroglycerine 0.5 mcg/kg/min continuous IV infusion, may increase by 1 mcg/kg q20min; titrate to MAP >70 mm Hg, systolic >90 mm Hg; usual max 5 mcg/kg/min.

-Captopril (Capoten), neonates: 0.05-0.1 mg/kg/dose PO q6-8h; infants: 0.15-0.3 mg/kg/dose PO q8h. Children 0.5 mg/kg/dose PO q6-12h. Titrate as needed up to max of 6 mg/kg/day [tabs: 12.5,25,50,100 mg]. Tablets can be crushed and made into suspension for small dosages, but must be used immediately as drug degrades quickly once dissolved.

-KCL 1-4 mEq/kg/day PO.

**10. Extras and X-rays:** CXR PA and LAT, ECG, echocardiogram.

**11. Labs:** ABG, SMA 7, CBC, cardiac enzymes, iron studies, digoxin level. UA.

## Atrial Fibrillation and Atrial Flutter

1. **Admit to:**
2. **Diagnosis:** Atrial fibrillation / flutter
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:**
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Cardioversion (if unstable or refractory to drug Tx):**

1. If unstable, **Synchronized Cardiovert** immediately. In stable patient with atrial fibrillation, consider starting quinidine or procainamide 24-48h prior.

-Quinidine gluconate, 2-10 mg/kg/dose IV q3-6h
-Procainamide, loading dose 3-6 mg/kg IV over 5 min (max 100 mg); may repeat every 5-10 minutes to max of 15 mg/kg (max 500 mg)
Maintenance 20-80 mcg/kg/min continuous IV infusion (max 2 gm/24 hrs)

2. Midazolam (Versed) 0.1 mg/kg IV over 2 min, repeat prn until amnesic.
3. Synchronous cardioversion: 0.5-1 Joules/kg. Consider esophageal overdrive pacing.

**Rate Control:**

**Digoxin:**

Initial digitalization establishes the body stores, and is given over 24 hours in three divided doses: ½ TDD at time 0 hours, 1/4 TDD in 8-12 hours, and 1/4 TDD 8-12 hours later (TDD is total digitalizing dose). Maintenance therapy is then started.

**Total Digitalizing Dose**

| | PO | IV |
|---|---|---|
| Premature infant | 15-40 mcg/kg | 10-30 mcg/kg |
| Full term newborn (0-2 weeks) | 30 mcg/kg | 20-25 mcg/kg |
| 2 wks-2 y | 40-50 mcg/kg | 30-40 mcg/kg |
| 2-10 y | 30-40 mcg/kg | 25-30 mcg/kg |
| >10 y | 1.5-2 mg | 10 mcg/kg (max 1 mg) |

**Maintenance Digoxin Dose**

| | PO | IV |
|---|---|---|
| Preterm neonate | 4-12 mcg/kg/day | 4-9 mcg/kg/day |
| Term neonate (0-2 wks) | 8-10 mcg/kg/day | 6-8 mcg/kg/day |
| 2 weeks - 2 y | 10-12 mcg/kg/day | 8-10 mcg/kg/day |
| 2-10 y | 8-10 mcg/kg/day | 6-8 mcg/kg/day |
| >10 y | 5 mcg/kg/day | 2-3 mcg/kg/day |
| Adult | 0.125-0.5 mg/day | 0.1-0.4 mg/day |

Divide bid if <10 yrs or qd if ≥10 yrs.
[caps: 50, 100, 200 mcg; tabs: 0.125, 0.250, 0.500 mg; oral elixir: 50 mcg/ml; inj: 100, 250 mcg/ml].

**Other Rate Controlling Agents:**

-Propranolol 0.01-0.1 mg/kg slow IV push over 10 minutes, repeat q6-8h prn (max 1 mg/dose) or 0.5-4 mg/kg/day PO q6-8h (max 60 mg/day) [tabs 10, 20, 40, 60, 80, 90 mg; inj 1 mg/ml; oral solutions: 4 mg/ml, 8 mg/ml, 80 mg/ml].

**Pharmacologic Conversion (after rate control):**

-Procainamide: Loading dose of 2-6 mg/kg/dose IV over 5 min, then 20-80 mcg/kg/min IV infusion (max 100 mg/dose or 2 gm/24h). Oral maintenance, 15-50 mg/kg/day PO q3-6h (max 4 gm/d). [tab: 250, 375, 500 mg; inj: 100 mg/ml, 500 mg/ml; tab, SR: 250, 500, 750, 1000 mg; caps: 250, 375, 500 mg]

**10. Extras and X-rays:** Portable CXR, ECG, 24h Holter; echocardiogram.

**11. Labs:** CBC, SMA 7, UA, ABG. Serum drug levels.

# Hypertensive Crisis

1. **Admit to:**
2. **Diagnosis:** Hypertensive Crisis (diastolic and/or systolic BP >95% for age on 3 separate occasions)
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** ECG, daily weights, inputs and outputs.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
   -Nitroprusside (Nipride) 0.5-10 mcg/kg/min continuous IV infusion. Titrate to desired blood pressure. Cyanide and thiocyanate toxicity may develop with prolonged use or in renal impairment.
   -Labetalol (Trandate) 0.2 mg/kg (max 20 mg) IV over 2 min or 0.4-1 mg/kg/hr continuous infusion.
   -Nifedipine (Procardia, Adalat) 0.25-0.5 mg/kg (max 10 mg) PO, may repeat q1-3h prn [10,20 mg capsules].
   -Hydralazine (Apresoline) 0.1-0.2 mg/kg/dose slow IV q2-6h (max 20 mg/dose)
   -Enalaprilat 5-10 mcg/kg/dose IV q8-24h prn.
10. **Extras and X-rays:** CXR, ECG, CT, renal Doppler and ultrasound, abdominal flat plate. Hypertensive intravenous pyelography (1, 2, 3 min x-ray).
11. **Labs:** CBC, SMA 7, BUN, creatinine, fresh urine for UA with micro. Urine specific gravity, thyroid panel, 24h urine for metanephrine; serum catecholamines; ANA, complement, ASO titer; toxicology screen, spot plasma renin activity.

# *Pulmonology*

## Asthma

1. **Admit to:**
2. **Diagnosis:** Exacerbation of asthma
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter, measure peak flow rate for older patients.
7. **Diet:**
8. **IV Fluids:** D5 1/4 NS or D5 1/2 NS as required.
9. **Special Medications:**

-Oxygen humidified prn, 1-6 L/min by NC or 25-80% by mask, keep sat >92%.

**Nebulized Beta 2 Agonist:**

-Albuterol (Ventolin) (0.5% = 5 mg/ml soln) nebulized 0.2-0.5 ml in 2 ml NS q2-6h and prn; may also be given by continuous aerosol.

**Corticosteroids:**

-Methylprednisolone (Solu-Medrol) 2 mg/kg/dose IV q6h x 4 doses, then 1 mg/kg/dose IV q6h x 3-5 days **OR**

-Prednisolone 1-2 mg/kg/day PO q12-24h x 3-5 days [syrup: 5 mg/5 ml; Prelone 15 mg/5 ml] **OR**

-Prednisone 1-2 mg/kg/day PO q12-24h x 3-5 days [tabs: 1, 2, 5, 10, 20, 50 mg; oral solution: 1 mg/ml, 5 mg/ml].

**Aminophylline and Theophylline:**

-Infrequently used; must follow theophylline levels (desired therapeutic range 10-20 mcg/ml). Erythromycin or carbamazepine may increase serum theophylline levels.

-Aminophylline loading dose, 5-6 mg/kg **total** body weight in D5 1/4 NS IV ove 20-30 min [1 mg/kg of aminophylline will raise levels by 2 mcg/ml].

-Aminophylline maintenance, continuous IV infusion (in D5 1/4 NS): Dose based on ideal body weight
1-6 mth: 0.5 mg/kg/h
6-12 mth: 0.6-0.75 mg/kg/h
12 mth-10 y: 1.0 mg/kg/h
10-16 y: 0.75-0.9 mg/kg/h
>16 y: 0.7 mg/kg/h **OR**

-Theophylline PO loading dose of 6 mg/kg, then maintenance of 80% of total daily maintenance IV aminophylline dose in 2-4 doses/day (depending on product).
1-6 mth: 9.6 mg/kg/day theophylline.
6-12 mth: 11.5-14.4 mg/kg/day theophylline.
12 mth-10 y: 19.2 mg/kg/day theophylline.
10-16 y: 14.4-17.3 mg/kg/day theophylline.
>16 y: 10 mg/kg/day theophylline.

-Give theophylline as sustained release theophylline preparation: q8-12h or liquid immediate release: q6h.

-Slo-Phyllin Gyrocaps, may open caps and sprinkle on food [60, 125, 250 mg caps] q8-12h **OR**

-Slobid Gyrocaps, may open caps and sprinkle on food [50, 75, 100, 125, 200, 300 mg caps]

-Theophylline oral liquid: 80 mg/15 ml, 10 mg/ml] q6-8h.

-Theo-Dur [100, 200, 300, 450 mg tabs; scored, may cut in half, but do not crush].
-Theophylline Products
Cap: 100, 200 mg
Cap, SR: 50, 60, 75, 100, 125, 130, 200, 250, 260, 300 mg
Liquid: 80 mg/15 ml, 10 mg/ml
Tab: 100, 125, 200, 300 mg
Tab, SR: 50, 75, 100, 125, 130, 200, 250, 260, 300, 400, 450, 500 mg

**Beta 2 Agonist, Corticosteroid, and Cromolyn Metered Dose Inhalers:**
-Albuterol (Ventolin, Proventil) or Metaproterenol (Alupent) MDI 2 puffs q1-6h prn with spacer and mask.
-Beclomethasone (Beclovent) MDI 1-2 puffs qid or 4 puffs bid (max 16 puffs/day) with spacer and mask, 5 min after bronchodilator, followed by gargling with water.
-Triamcinolone (Azmacort) MDI 1-2 puffs qid or 4 puffs bid (max 16 puffs/d).
-Flunisolide (AeroBid) MDI 1-2 puffs bid-qid (max 8 puffs/d).
-Cromolyn sodium (Intal) MDI 2-4 puffs qid-tid; or powder 20 mg/capsule bid-qid; or nebulized 1% sln, 1 amp (2 ml, 20 mg) q6h. Not recommended for acute treatment since duration of onset is 2-4 weeks.

**Oral Beta 2 Agonists:**
-Albuterol liquid (Proventil) 2-6 years: 0.1-0.2 mg/kg/dose PO q6-8h or 6-12 years: 2 mg PO tid-qid; >12 years: 2-4 mg PO tid-qid [soln: 2 mg/5 ml; tab: 2, 4 mg; ER tab: 4 mg] **OR**
-Metaproterenol liquid (Alupent) 0.3-0.5 mg/kg/dose PO q6-8h. 6-9 years: 10 mg PO q6-8h; >9 years: 20 mg PO q6-8h. [soln: 10 mg/5 ml; tab: 10, 20 mg]

11. **Extras and X-rays:** CXR, pulmonary function test, skin allergy testing. PEFR as needed and may be helpful in older patients.
12. **Labs:** CBC, CBG/ABG. Urine antigen screen, UA.

## Allergic Rhinitis and Conjunctivitis

**Antihistamines:**
-Actifed OTC [per tab or 10 ml syrup: triprolidine 2.5 mg, pseudoephedrine 60 mg] 4 mg pseudoephedrine/kg/day po tid-qid
4 m-2 y: 1.25 ml PO q6-8h
2-4 y: 2.5 ml PO q6-8h
4-6 y: 3.75 ml PO q6-8h
6-12y: 5 ml PO q6-8h
>12 y: 10 ml PO q6-8h.
-Brompheniramine (Dimetane)
0.5 mg/kg/day PO q6h prn (for elixir or 4 mg tablet) or q8-12h prn (for SR tablets)
[elixir 2 mg/5 ml; tab: 4 mg; SR tab: 8, 12 mg]
-Chlorpheniramine maleate (Chlor-Trimeton): 0.35 mg/kg/day PO q4-6h
2-6y: 1 mg PO q4-6h (max 4 mg/day)
6-12y: 2 mg PO q4-6h (max 12 mg/day)
>12y: 4 mg PO q4-6h or 8-12 mg SR q8-12h (max 24 mg/day).
[soln: 2 mg/5 ml; tabs: 4, 8, 12 mg; SR tabs: 8, 12 mg]
-Hydroxyzine (Vistaril) 2-4 mg/kg/day PO q6h (max 50 mg/dose) [tabs 10, 25, 50,100 mg; susp 5 mg/ml; syrup 2 mg/ml].

-Terfenadine (Seldane), >12 yr: 60 mg PO bid [60 mg tabs]. Coadministration with erythromycin is contraindicated because of cardiac rhythm disturbances.
-Astemizole (Hismanal):
6-12 yr: 5 mg/day PO qd
>12 yr: 10 mg PO qd
[10 mg tabs].
-Loratadine (Claritin) >12 yr 10 mg PO qd. [tab: 10 mg]

**Decongestants:**
-Pseudoephedrine (Sudafed, Novafed): children <12 yr: 4 mg/kg/day PO q6h. Children >12 yr and adults: 30-60 mg/dose PO q6-8h; sustained release 120 mg PO q12h. Max dose: 240 mg/24h. [Tabs: 30, 60 mg; sustained release caps: 120 mg; syrup: 15, 30 mg/5 ml; drops: 7.5 mg/0.8 ml]

**Intranasal Steroids and Cromolyn:**
-Beclomethasone: 1-2 sprays into each nostril bid-tid. Beconase AQ nasal, Vancenase nasal, Vancenase AQ nasal.
-Flunisolide (Nasalide) 1 spray into each nostril bid-tid.
-Cromolyn (Nasalcrom) 1 puff into each nostril q3-4h. Not recommended for acute treatment since duration of onset is 2-4 weeks.
-Triamcinolone (Nasacort)
>12 y: 2 sprays into each nostril qd.

**Allergic Conjunctivitis Therapy:**
-Cromolyn ophthalmic (Opticrom) instill 2 drops in each eye q4-6h.
-Naphazoline/pheniramine (Opcon A, Naphcon A) 1-2 drops in each eye q4-6h.

# Anaphylaxis

1. **Admit to:**
2. **Diagnosis:** Anaphylaxis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, elevate legs, ECG monitoring.
7. **Diet:**
8. **IV Fluids:** 2 IV lines. Normal saline or LR 10-20 ml/kg rapidly over 1h, then D5 1/2 NS at 1-1.5 times maintenance.
9. **Special Medications:**
-O2 at 6 L/min by NC or mask.
-Epinephrine, 0.01 mg/kg [0.01 ml/kg of 1 mg/ml = 1:1000] (maximum 0.5 mg ml) subcutaneously, repeat every 15-20 minutes prn. If anaphylaxis is the consequence of an insect sting or intramuscular injection, inject an additional 0.1 ml of epinephrine at the site to slow antigen absorption.
-Epinephrine racemic (if stridor is present), 2% nebulized 0.05 ml/kg/dose in 2.5 ml NS over 15 min q30min-4h (max 0.5 ml/dose).
-Albuterol (Ventolin) (0.5%, 5 mg/ml sln) nebulized 0.01-0.03 ml/kg (max 1 ml) in 2 ml NS q1-2h and prn; may be used in addition to epinephrine if necessary.

**Corticosteroids:**
-Corticosteroids prevent the late phase of the allergic response.
-If symptoms are mild, give prednisone, initially 2 mg/kg/day (max 40 mg) PO q12h, then taper the dose off over 4-5 days. For more severe symptoms,

give hydrocortisone 5 mg/kg IV q8h until stable, then change to oral prednisone.

**Antihistamines:**

-Diphenhydramine (Benadryl) 1 mg/kg/dose IV/IM/IO/PO q6h, max 50 mg/dose; antihistamines are not a substitute for epinephrine.

-Hydroxyzine (Vistaril) 1 mg/kg/dose IM/IV/PO q4-6h, max 50 mg/dose

**10. Extras and X-rays:** Portable CXR, lateral soft tissue neck x-rays, ECG.

**11. Labs:** CBC, SMA 7, ABG.

## Pleural Effusion

1. **Admit to:**
2. **Diagnosis:** Pleural effusion
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Diet:**
7. **IV Fluids:**
8. **Extras and X-rays:** CXR PA and LAT, lateral decubitus, ultrasound, sputum AFB. Pulmonary consult.
9. **Labs:** CBC with differential, SMA 7, protein, albumin, amylase, ESR, UA.

**Pleural fluid**:

**Tube 1** - LDH, protein, amylase, triglycerides, glucose, specific gravity (10 ml red top).

**Tube 2** - Gram stain, culture and sensitivity, AFB, fungal culture and sensitivity, wet mount (20-60 ml).

**Tube 3** - Cell count and differential (5-10 ml, EDTA purple top).

**Tube 4** - Cytology, antigen tests for S pneumoniae, H influenza, (25-50 ml, heparinized).

**Syringe** - pH (2 ml, heparinized).

**Evaluation of Thoracentesis Fluid:**

| | **Transudate** (heart failure, nephrosis, cirrhosis) | **Exudate** (neoplasm, TB) |
|---|---|---|
| Specific gravity | <1.016 | >1.016 |
| Protein ratio pleural fluid/serum | <0.5 | >0.5 |
| Protein (gm/100 ml) | <3.0 | >3.0 |
| LDH ratio pleural fluid/serum | <0.6 | >0.6 |
| WBC | <1,000/$mm^3$ | >1,000/$mm^3$ |
| Glucose | Equivalent to Serum | May be less than serum |

# *Infectious Diseases*

## Suspected Sepsis

1. **Admit to:**
2. **Diagnosis:** Suspected sepsis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, cooling measures prn temp >38°, consent for lumbar puncture. Strict isolation.
7. **Diet:**
8. **IV Fluids:** Correct hypovolemia if present; NS 10-20 ml/kg IV bolus, then IV fluids at 1-1.5 times maintenance.
9. **Special Medications:**

**Term Newborn Infants <1 months old (GpB strep, E coli, or GpD strep, gram negatives, Listeria monocytogenes):** Ampicillin and cefotaxime.

Ampicillin: (IV, IM)
<1200 gm 0-4 weeks: 100 mg/kg/day q12h
1200-2000 gm: <7d: 100 mg/kg/day q12h; >7d: 150 mg/kg/day q8h
>2000 gm: <7d: 150 mg/kg/day q8h; >7d: 200 mg/kg/day q6h
Cefotaxime (Claforan): (IV/IM)
<1200 grams: 0-4 wks: 100 mg/kg/day q12h; >1200 grams: 0-7 days: 100 mg/kg/day q12h; >7 days: 150 mg/kg/day divided q8h

**Infant 1-2 months old (H. flu, strep pneumonia, N meningitides, GpB strep):**
-Ampicillin 100 mg/kg/day IV/IM q6h **AND EITHER**
-Cefotaxime (Claforan) 100 mg/kg/day IV/IM q6h **OR**
-Gentamicin 7.5 mg/kg/day IV/IM q8h.

**Children 2 months to 18 years old (S pneumonia, H flu, N. meningitides):**
-Cefotaxime (Claforan) 100 mg/kg/day IV/IM q6h, max 12 g/d **ORor**
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/d

**Neutropenic Patients (Gram negative bacilli, Pseudomonas, Staph, Strep viridans):**
-Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day of ticarcillin IV/IM q4-6h, max 18 g/d **OR**
-Ceftazidime (Fortaz) 100-150 mg/kg/day IV/IM q8h, max 12 gm/d **AND**
-Tobramycin or Gentamicin (normal renal function):
<5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.
5-10 yr: 6.0 mg/kg/day IV/IM q8h.
>10 yr: 5.0 mg/kg/day IV/IM q8h **AND**
-Vancomycin (if patient has signs of central line infection) 40-60 mg/kg/day IV q6h, max 2 g/d.

10. **Symptomatic Meds:**
-Ibuprofen (Advil) 5-10 mg/kg/dose PO q6h-8h.
-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn temp >39 C or pain
11. **Extras and X-rays:** CXR.
12. **Labs:** CBC, SMA 7. Blood Culture and sensitivity. UA, urine Culture and sensitivity. ESR, antibiotic levels. Stool for wright stain.

Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia) and viral cultures. Urine antigen screen for H flu, group B strep, pneumococcus, meningococcus.

**CSF Tube 1** - Gram stain, Culture and sensitivity for bacteria, antigen screen (1-2 ml).
**CSF Tube 2** - Glucose, protein (1-2 ml).
**CSF Tube 3** - Cell count and differential (1-2 ml).

## Empiric Therapy of Meningitis

1. **Admit to:**
2. **Diagnosis:** Meningitis.
3. **Condition:** Guarded.
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Strict isolation precautions. Inputs and outputs, daily weights; cooling measures prn temp >38; consent for lumbar puncture. Monitor for signs of increased intracranial pressure.
7. **Diet:**
8. **IV Fluids:** Isotonic fluids at maintenance rate.
9. **Special Medications:**

**Term Newborn Infants <1 months old (Group B strep, E coli, or GpD strep, gram negatives, Listeria):**
-Ampicillin, 0-7 d: 150 mg/kg/day IV/IM q8h; >7d: 200 mg/kg/day IV/IM q6h **AND**
-Cefotaxime (Claforan): <7d: 100 mg/kg/day IV/IM q12h; >7 days: 150 mg/kg/day q8h IV/IM **OR**
-Gentamicin or Tobramycin 5 mg/kg/day IV/IM q12h

**Infant 1-3 months old (H. flu, strep pneumonia, N. Meningitides, GpB strep, E coli):**
-Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h
-Dexamethasone 0.15 mg/kg/dose IV q6h x 4 days (16 doses; indicated to decrease inflammation and hearing loss; use in documented H flu infections only). Initiate prior to antibiotics.

**Children 3 months to 18 years old (S pneumonia, H flu, N. meningitides):**
-Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h, max 12 g/d **AND**
-Vancomycin 60 mg/kg/day IV q6h (due to increased incidence of strep pneumoniae resistance), max 2 g/d.
-Dexamethasone (see above).

10. **Symptomatic Meds:**
-Ibuprofen 5-10 mg/kg/dose PO q6-8h prn.
-Acetaminophen 15 mg/kg PO/PR q4h prn temp >38° or pain.
11. **Extras and X-rays:** CXR. CT scan or Xenon scan for increased intracranial pressure or subdural effusion.
12. **Labs:** CBC, SMA 7. Blood culture and sensitivity. UA, urine culture and sensitivity; urine specific gravity. Antibiotic levels. Stool for wright stain. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia) and viral cultures. Urine antigen screen for H flu, group B strep pneumococcus, meningococcus. Throat culture; urine and blood antigen tests.

**Lumbar Puncture:** (spinal needles, <1 yrs: 1½ inch, mid-childhood: 2½ inch; adolescents: 3½ inch).
**CSF Tube 1** - Gram stain, culture and sensitivity, bacterial antigen screen (1-2 ml).

**CSF Tube 2** - Glucose, protein (1-2 ml).
**CSF Tube 3** - Cell count and differential (1-2 ml).

## Specific Therapy of Meningitis and Encephalitis

**Dexamethasone** (0.6 mg/kg/day IV q6h x 4 days) with first dose given preferably before the first dose of antibiotics; decreases hearing deficits and possibly other neurologic sequelae in Haemophilus influenzae meningitis and perhaps other types of meningeal infections.

**Streptococcus pneumoniae:**

Sensitivities must be determined before treating with penicillin or cephalosporin monotherapy.

-Penicillin G 250,000 U/kg/day IV/IM q4h x 10d, max 24 MU/day **OR**
-Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h, max 12 gm/day **AND**
-Vancomycin 60 mg/kg/day IV q6h, max 2 g/d **OR**
-Rifampin 20 mg/kg/day IV, max 600 mg [inj: 600 mg]

**Neisseria meningitides:**

-Penicillin G 250,000 U/kg/day IV/IM q4h x 7-10d, max 24 MU/d.
-Consider Dexamethasone.

**Haemophilus influenzae**

-Cefotaxime (Claforan) 200 mg/kg/day IV/IM q6h x 10d (max 12 g/d) **OR**
-Ampicillin (beta-lactamase negative) 200 mg/kg/day IV/IM q6h x 10d, max 12 g/d.

**Group A or non-enterococcal Group D Streptococcus:**

-Penicillin G 250,000 U/kg/day IV/IM q4-6h, max 24 MU/d.

**Listeria monocytogenes or Group B strep:**

-Ampicillin 200 mg/kg/day IV/IM q6h x 14d, max 12 g/d **AND**
-Gentamicin or Tobramycin (normal renal function):
<5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.
5-10 yr: 6.0 mg/kg/day IV/IM q8h.
>10 yr: 5.0 mg/kg/day IV/IM q8h

**Staphylococcus aureus:**

-Nafcillin or Methicillin 150-200 mg/kg/day IV/IM q4-6h, max 12 g/d **OR**
-Vancomycin 40-60 mg/kg/day IV q6h, max 2 g/d (may require concomitant intrathecal therapy).

**Herpes Simplex Encephalitis:**

-Acyclovir (Zovirax) 25-50 mg/kg/day IV over 1h or longer q8h x 21 days **OR**
-Vidarabine 15 mg/kg IV infusion over 12-24 hr daily x 10d.

# Infective Endocarditis

1. **Admit to:**
2. **Diagnosis:** Infective endocarditis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Diet:**
7. **IV Fluids:**
8. **Special Medications:**

**Subacute Bacterial Endocarditis Empiric Therapy:**

-Penicillin G 250,000 U/kg/day IV/IM q4-6, max 24 MU/d **AND**

-Gentamicin or Tobramycin (normal renal function):

<5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.

5-10 yr: 6.0 mg/kg/day IV/IM q8h.

>10 yr: 5.0 mg/kg/day IV/IM q8h

Note: may use lower doses of aminoglycoside if strictly using for synergy.

**Acute Bacterial Endocarditis Empiric Therapy (including IV drug user):**

-Gentamicin or Tobramycin, see above **AND EITHER**

-Nafcillin or Oxacillin 150 mg/kg/day IV/IM q6h, max 12 g/d **OR**

-Vancomycin 40-60 mg/kg/day IV q6h, max 2 g/d

**Streptococci viridans/bovis:**

-Penicillin G 150,000 u/kg/day IV/IM q4-6h, max 24 MU/d **OR**

-Vancomycin 40 mg/kg/day IV q6h, max 2 g/day.

**Staphylococcus aureus (methicillin sensitive):**

-Nafcillin or Oxacillin 150 mg/kg/day IV/IM q6h, max 12 g/day **AND**

-Gentamicin or Tobramycin, see above.

**Methicillin resistant Staphylococcus aureus:**

-Vancomycin 40-60 mg/kg/day IV q6h, max 2 g/d.

**Staphylococcus epidermidis:**

-Vancomycin 40-60 mg/kg/day IV q6h, max 2 g/d **AND**

-Gentamicin or Tobramycin, see above; may use lower doses if strictly using for synergy.

9. **Extras and X-rays:** CXR PA and LAT, echocardiogram, ECG. Cardiology and infectious disease consultation.
10. **Labs:** CBC, ESR. Bacterial culture and sensitivity x 3-4 over 24h (if septic, draw before starting antibiotic); MBC. Antibiotic levels. UA, urine culture and sensitivity.

# Endocarditis Prophylaxis

**Recommended Standard Prophylactic Regimen for Dental, Oral, or Upper Respiratory Tract Procedures in High Risk Patients:**

-Amoxicillin: 50 mg/kg/dose (max 3.0 g) given orally 1 hour before the procedure, then 25 mg/kg (max 1.5 gm) given 6 hours after the initial dose.

**For Amoxicillin/Penicillin Allergic Patients:**

-Erythromycin: 20 mg/kg/dose (max 1 gm) given orally 2 hours before the procedure, then 10 mg/kg (max 500 mg) given 6 hours after the initial dose.

# Empiric Therapy of Pneumonia

1. **Admit to:**
2. **Diagnosis:** Pneumonia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Respiratory isolation, pulse oximeter, inputs and outputs, postural percussion and drainage, nasotracheal suctioning prn. Bronchial clearance techniques, vibrating vest.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

-Humidified O2 by NC at 2-4 L/min or 25-100% by mask, adjust to keep saturation >92% (or >95% if chronic lung disease is present)

**Term Neonates <1 month (gram-positive cocci, group B streptococcus and occasionally Staph. aureus, and gram-negative enteric bacilli):**

-Ampicillin 100 mg/kg/day IV/IM q6h **OR**
-Nafcillin (Nafcil) 100 mg/kg/day IV/IM q6h **AND**
-Cefotaxime (Claforan) <1 wk: 100 mg/kg/day IV/IM q12h; >1 wk: 150 mg/kg/day IV/IM q8h **OR**
-Gentamicin 5 mg/kg/day IV/IM q12h.

**Children 1 month-5 years old (RSV, adenovirus, parainfluenza, S. pneumoniae, H. influenzae type B, Chlamydia trachomatous (<18 weeks), Staph aureus):**

-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h **OR**
-Cefotaxime (Claforan) 150 mg/kg/day IV/IM q8h **OR**
-Ampicillin 200 mg/kg/day IV/IM q6h **AND**
-Gentamicin or Tobramycin (normal renal function): 7.5 mg/kg/day IV/IM q8h **OR**

If chlamydia is strongly suspected, add erythromycin 20-40 mg/kg/day IV q6h.

**Oral Therapy:**

-Cefuroxime axetil (Ceftin) <2 y: 125 mg PO bid; 2-12 yrs: 250 mg PO bid; >12 yrs: 250-500 mg PO bid or 30 mg/kg/day PO q12h, max 500 mg/dose [susp: 125 mg/5 ml; tabs 250,500 mg]
-Loracarbef (Lorabid) 30 mg/kg/day PO q12h, max 200 mg/dose [susp: 100 mg/5 ml, cap: 200 mg]
-Cefpodoxime (Vantin) 10 mg/kg/day PO q12h (max 200 mg/day) [susp: 50 mg/5 ml, 100 mg/5 ml; tabs: 100 mg, 200 mg]
-Cefprozil (Cefzil) 30 mg/kg/day PO q12h, max 500 mg/dose [susp 125 mg/5 ml, 250 mg/5 ml; tabs 250 mg, 500 mg].
-Cefixime (Suprax) 8 mg/kg/day PO qd-bid, max 400 mg/dose [tabs: 200, 400; susp: 100 mg/5 ml] Note: Suspension results in higher serum levels than tabs.
-Clarithromycin (Biaxin) 15 mg/kg/day PO q12h, max 500 mg/dose [susp: 125 mg/5 ml, 250 mg/5 ml; tab: 250, 500 mg].
-Amoxicillin/clavulanate (Augmentin) 30-40 mg/kg/day of amoxicillin PO q8h x 7-10d, max 500 mg/dose [chew tabs 125,250 mg; tabs: 250, 500 mg; elixir 125 mg/5 ml, 250 mg/5 ml]
-TMP/SMX (Bactrim, Septra), 6-12 mg TMP/kg/day PO q12h [single strength tab: 80 mg/400 mg; double strength tab: 160 mg/800 mg; susp per 5 ml: 40 mg/200 mg].

**Community acquired pneumonia 5-18 years old (viral, M pneumoniae,**

**chlamydia pneumoniae, pneumococcus, legionella):**

-Erythromycin 30-50 mg/kg/day IV/IM or PO q6h
  erythromycin estolate
    susp: 125 mg/5 ml, 250 mg/5 ml
    chew tab: 125,250 mg
    tab: 500 mg
  erythromycin ethylsuccinate
    susp: 200 mg/5 ml, 400 mg/5 ml
    chew tab: 200 mg
    tab: 400 mg
  erythromycin base
    tab: 250, 333, 500 mg
  erythromycin lactobionate
    inj: 500 mg, 1 gm

-Clarithromycin (Biaxin) 15 mg/kg/day PO q12h, max 500 mg/dose [susp: 125 mg/5 ml, 250 mg/5 ml; tab: 250, 500 mg]. **OR**

-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/d **OR**

**Immunosuppressed, neutropenic pneumonia (S. pneumoniae, Gp A strep, H flu, gram neg enterics, Klebsiella, Mycoplasma Pneumonia, Legionella, Chlamydia pneumoniae, S aureus):**

-Tobramycin (normal renal function):
  <5 yr (except neonates): 7.5 mg/kg/day IV/IM q8h.
  5-10 yr: 6.0 mg/kg/day IV/IM q8h.
  >10 yr: 5.0 mg/kg/day IV/IM q8h **OR**

-Ceftazidime 150 mg/kg/day IV/IM q8h, max 12 g/day **AND**

-Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day of ticarcillin IV q4-6h, max 18 g/day **OR**

-Nafcillin 150 mg/kg/day IV/IM q6h, max 12 gm/day **OR**

-Vancomycin 40 mg/kg/day IV q6h, max 2 gm/day.

**Cystic Fibrosis Exacerbation (P aeruginosa):**

-Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day of ticarcillin IV q4-6h, max 18 g/d **OR**

-Piperacillin 200-300 mg/kg/day IV/IM q6h, max 24 gm/day **AND**

-Tobramycin, 7.5 mg/kg/day IV/IM q8h **OR**

-Ceftazidime 150 mg/kg/day IV/IM q8h, max 12 g/day **OR**

-Aztreonam 150-200 mg/kg/day IV/IM q6-8h, max 8 g/day **OR**

-Imipenem/Cilastatin 60-100 mg/kg/day imipenem component IV q6-8h, max 4 g/day.

**Bronchodilators:**

-Albuterol (Proventil, Ventolin) (0.5%, 5 mg/ml sln) nebulized 0.01-0.03 ml/kg (max 1 ml) in 2 ml NS q1-6h and prn.

**10. Symptomatic Medications:**

-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q3-4h prn temp >38° or pain.

**11. Extras and X-rays:** CXR PA, LAT, PPD.

**12. Labs:** CBC, ABG, blood culture and sensitivity. Sputum gram stain, culture and sensitivity, AFB. Antibiotic levels. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia) and cultures for respiratory viruses. UA, culture and sensitivity.

# Specific Therapy of Pneumonia

**Pneumococcal pneumonia:**
- -Erythromycin 30-50 mg/kg/day PO or IV/IM q6h, max 4 gm/day IV, 2 gm/day PO **OR**
- -Vancomycin 40 mg/kg/day IV q6h, max 2 gm/day **OR**
- -Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6h, max 12 g/day **OR**
- -Penicillin G 150,000 U/kg/day IV/IM q4-6h (max 24 MU/day) or Pen VK 25-50 mg/kg/day PO q6h, max 2 gm/day if for mild infection.

**Staphylococcus aureus:**
- -Oxacillin or Nafcillin 150-200 mg/kg/day IV/IM q4-6h, max 12 g/day **OR**
- -Vancomycin 40 mg/kg/day IV q6h, max 2 g/day

**Haemophilus influenzae (<5 yr of age):**
- -Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q8h, max 12 g/day **OR**
- -Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h (beta-lactamase pos), max 9 g/day **OR**
- -Ampicillin 100-200 mg/kg/day IV/IM q6h (beta-lactamase negative); max 12 g/day

**Pseudomonas aeruginosa:**
- -Tobramycin or Amikacin, 7.5 mg/kg/day IV/IM q8h **AND**
- -Piperacillin or Ticarcillin 200-300 mg/kg/day IV/IM q4-6h, max 24 g/day **OR**
- -Ceftazidime 150 mg/kg/day IV/IM q8h, max 12 g/day.

**Mycoplasma pneumoniae:**
- -Clarithromycin (Biaxin) 15 mg/kg/day PO q12h, max 1 gm/day [susp: 125 mg/5 ml, 250 mg/5 ml; tab: 250, 500 mg].
- -Erythromycin 30-50 mg/kg/day PO or IV q6h x 14-21 days, max 4 gm/day IV, 2 gm/day PO.
  - erythromycin estolate
    - susp: 125 mg/5 ml, 250 mg/ml
    - chew tab: 125, 250 mg
    - tab: 500 mg
  - erythromycin ethylsuccinate
    - susp: 200 mg/5 ml, 400 mg/5 ml
    - chew tab: 200 mg
    - tab: 400 mg
  - erythromycin base
    - tab: 250, 333, 500 mg
- -Tetracycline (**>8 yrs only**) 25-50 mg/kg/day PO q6h x 14-21 days, max 2 gm/day [caps: 100, 250, 500 mg; tabs: 250, 500 mg]

**Moraxella catarrhalis:**
- -Clarithromycin (Biaxin) 15 mg/kg/day PO q12h, max 1 gm/day [susp: 125 mg/5 ml, 250 mg/5 ml; tab: 250, 500 mg] **OR**
- -Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/day **OR**
- -Erythromycin 30-50 mg/kg/day IV/IM or PO q6h x 21 days **OR**
- -Trimethoprim/SMX (Bactrim) 6-12 mg TMP/kg/day PO/IV q12h [per 5 ml: Trimethoprim 40 mg, sulfamethoxazole 200 mg; single strength tab: 80 mg/400 mg; double strength tab: 160 mg/800 mg].

**Chlamydia pneumoniae (TWAR), psittaci, trachomatous:**
- -Erythromycin 30-50 mg/kg/day IV q6h, max 4 gm/day [inj: 500 mg, 1 gm] **OR**
- -Azithromycin (Zithromax) >16 yrs 500 mg PO on day 1; 250 mg PO qd on days 2-5 [cap: 250 mg].

**Influenza A:**
- -Amantadine (Symmetrel) 1-9 yr: 5-9 mg/kg/day PO qd-bid (max 200 mg/day);

>9 yrs: 100-200 mg/day PO bid x 7d [syrup 50 mg/5 ml, cap: 100 mg].
-Rimantadine <10 y: 5 mg/kg/day PO qd (max 150 mg); >10 y: 100 mg PO bid [syrup: 50 mg/5 ml; tab: 100 mg]

# Bronchiolitis

1. **Admit to:**
2. **Diagnosis:** Bronchiolitis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter, peak flow rate. Respiratory isolation.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
   -Oxygen, humidified 1-4 L/min by NC or 40-60% by mask, keep sat >92%, or >95% if history of chronic lung disease.

**Nebulized Beta 2 Agonists:**
-Albuterol (Ventolin, Proventil) (0.5%, 5 mg/ml sln) nebulized 0.2-0.5 ml in 2 ml NS (0.10-0.15 mg/kg) q1-4h prn.

**Respiratory Syncytial Virus (severe lung disease or underlying cardiopulmonary disease):**
-Ribavirin (Virazole) 6 g vial (20 mg/ml) in water, aerosolized by SPAG nebulizer over 18-20h qd x 3-5 days or 2 gm over 2 hrs q8h x 3-5 days.

**Influenza A:**
-Amantadine (Symmetrel) 1-9 yr: 4.4-8.8 mg/kg/day PO qd-bid (max 150 mg/day); >9 yrs: 100-200 mg/day PO qd-bid x 7d [syrup 50 mg/5 ml, 100 mg cap] **OR**
-Rimantadine <10 y: 5 mg/kg/day PO qd (max 150 mg); >10 y: 100 mg PO bid [syrup: 50 mg/5 ml; tab: 100 mg]

**Pertussis:**
-Erythromycin estolate 40-50 mg/kg/day PO q6h x 10 days, max 2 g/day [cap: 250 mg; tab: 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] or erythromycin lactobionate 40 mg/kg/day IV q6h, max 4 g/day.

**Oral Beta 2 Agonists and Acetaminophen:**
-Albuterol liquid (Proventil, Ventolin) 2-6 years: 0.1-0.2 mg/kg/dose PO q6-8h; 6-12 years: 2 mg PO tid-qid; >12 years: 2-4 mg PO tid-qid [soln: 2 mg/5 ml; tab: 2,4 mg; tab, SR: 4 mg]
-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4-6h prn temp >39°.

10. **Extras and X-rays:** CXR, sweat test.
11. **Labs:** CBC, SMA 7, CBG/ABG. Blood culture and sensitivity, UA. Urine antigen screen. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia), viral and pertussis cultures.

# Croup

1. **Admit to:**
2. **Diagnosis:** Croup
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter, laryngoscope and endotracheal tube at bedside. Respiratory isolation. Quiet room, inputs and outputs.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications and Treatment:**
   -Oxygen, cool mist, 1-2 L/min by NC or 40-60% by mask, keep sat >92%.
   -Racemic Epinephrine (2.25% sln) 0.05 ml/kg/dose (max 0.5 ml) in 2-3 ml sterile water nebulized q1-6h.
   -Dexamethasone (Decadron) 0.25-0.5 mg/kg/dose IM/IV q6h prn; max dose 10 mg **OR**
   -Prednisone 1-2 mg/kg/day PO q12-24h x 3-5 days [tabs: 1, 2, 5, 10, 20, 50 mg; oral solution: 1 mg/ml, 5 mg/ml] **OR**
   -Prednisolone 2 mg/kg/day PO q12-24h x 3-5 days [5 mg/5 ml, Prelone 15 mg/5 ml].
10. **Extras and X-rays:** CXR PA and LAT, soft tissue x-ray of neck for characteristic "steeple sign."
11. **Labs:** CBC, CBG/ABG, blood culture and sensitivity; UA, culture and sensitivity. Urine antigen screen. Nasopharyngeal washings for direct fluorescent antibody (RSV, adenovirus, parainfluenza, influenza virus, chlamydia) and viral cultures.

# Pneumocystis Carinii Pneumonia

1. **Admit to:**
2. **Diagnosis:**
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Daily weights. Body fluid precautions.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Pneumocystis Carinii Pneumonia:**

-Oxygen prn for hypoxia

-Trimethoprim/Sulfamethoxazole (Bactrim, Septra) 20 mg TMP/kg/day IV q6h x 14-21 days [susp 5 ml: TMP 40 mg/SMX 200 mg; SS tab: TMP 80 mg/SMX 400 mg; DS tab: TMP 160 mg/SMX 800 mg; inj per ml: TMP 16 mg/SMX 80 mg] **OR**

-Pentamidine isethionate 4 mg/kg/day IV over 1-2h for 14-21d

-Prednisone

Patients >13 yrs old with hypoxia: Oral prednisone 80 mg/day in 2 divided doses is recommended per day 1-5 of therapy, 40 mg/day on days 6-10, and 20 mg/day on days 11-21.

**PCP Prophylaxis:**

-Trimethoprim/SMX 5 mg trimethoprim/kg/day PO bid for 3 times a week.

[susp 5 ml: TMP 40 mg/SMX 200 mg; SS tab: TMP 80 mg/SMX 400 mg; DS tab: TMP 160 mg/SMX 800 mg] **OR**

-Dapsone 1 mg/kg/day PO q24h [tabs: 25,100 mg].

**10. Extras and X-rays:** CXR PA and LAT, PPD.

**11. Labs:** CBC, SMA 7, LDH. Blood culture and sensitivity x 2. Sputum Gram stain, culture and sensitivity. Silver stain for Pneumocystis, AFB. Serum CD4, HIV RNA. Urine culture and sensitivity, UA.

## Opportunistic Infections in AIDS

**Oropharyngeal Candida Infections:**

-Clotrimazole troches 10 mg dissolve in mouth 5 times/24h **OR**

-Ketoconazole (Nizoral) 5-10 mg/kg/day PO q12-24h [tab: 200 mg] **OR**

-Nystatin susp. Premature infants 1 ml; infants 2 ml; children 4-5 ml. Swish and swallow qid.

-Fluconazole (Diflucan) 10 mg/kg IV or PO loading dose, followed by 3-6 mg/kg PO or IV qd [inj: 2 mg/ml; tabs: 50, 100, 200 mg, susp: 10 mg/ml, 40 mg/ml].

**Invasive or Disseminated Candidiasis:**

-Amphotericin B, test dose of 0.1 mg/kg (max 1 mg), followed by remainder of 1st days dose if tolerated. Initial dose: 0.25 mg/kg/day; increase by 0.25 mg/kg/day q1-2 days. Usual dose 0.5-1 mg/kg; max dose 50 mg.
Pretreatment (except test dose) - Acetaminophen, hydrocortisone, diphenhydramine; give Demerol during infusion if chilling occurs.

-Liposomal Amphotericin 5 mg/kg IV over 2 hrs

**Antiretroviral Therapy:**

-Zidovudine (Retrovir, AZT) - oral
<2 weeks: 8 mg/kg/day PO q6h
2-4 weeks: 12 mg/kg/day PO q6h
4 weeks - 3 mos: 16 mg/kg/day PO q6h
3 mth-12 y: 90-180 mg/m$^2$/dose q6h (max 200 mg/dose)
>12 y Asymptomatic: 100 mg q4h while awake (max 500 mg/day).
Symptomatic: 200 mg q4h while awake (max 1200 mg/day) x 1 month, then 100 mg q4h.
[soln: 10 mg/ml]

-Zidovudine - intravenous
Infants: 6 mg/kg/day IV q6h
3 mth-12 y: 0.5-1.8 mg/kg/hr continuous IV infusion or 100 mg/m$^2$/dose IV q6h
>12 y: 1-2 mg/kg q4h
[inj: 10 mg/ml]

-Lamivudine (Epivir, 3TC)
3-12 y: 8 mg/kg/day PO bid (max 150 mg/dose)
>12 y: 150 mg PO bid
[tab: 150 mg; soln: 10 mg/ml]
Comment: Used in combination with zidovudine.

-Didanosine (Videx, ddI)
<1 year or $\leq$0.4 m$^2$: 100-300 mg/m$^2$ /day PO q12h (1 tablet per dose).
$\geq$1 year: 100-300 mg/m$^2$/day PO q12h (2 tablets per dose).
For children $\geq$35 kg
35-49 kg: 125 mg PO q12h (2 tablets per dose) **OR**

167 mg PO q12h (buffered oral soln)
50-74 kg: 200 mg PO q12h (2 tablets per dose) **OR**
250 mg PO q12h (using buffered oral soln) **OR**
≥75 kg: 300 mg PO q12h (use two tablets per dose) **OR**
375 mg PO q12h (using buffered oral soln).

Tabs, buffered: 25, 50, 100, 150 mg
Buffered oral solution (single dose packet): 100, 167, 250, 375 mg
Pediatric oral solution: 10 mg/ml (when reconstituted).
Comment: This drug is very acid labile, and it must be taken on an empty stomach.

**Cryptococcus Neoformans Meningitis:**
-Amphotericin B 1 mg/kg/day IV qd over 2-4h x 8-12 weeks (see test dose and titration above) **OR**
-Fluconazole (Diflucan) 3-6 mg/kg/day IV/PO qd [inj: 2 mg/ml; tabs: 50, 100, 200 mg, susp: 10 mg/ml, 40 mg/ml].

**Herpes Simplex Infections:**
-Acyclovir (Zovirax) (HSV) 5 mg/kg/dose IV (10 mg/kg if visceral involvement) q8h for 7-10d (infuse each dose over 1 hr) or 20 mg/kg/dose PO q6h (max 800 mg/dose) [caps: 200 mg, tabs: 400, 800 mg; susp: 200 mg/5 ml]..

**Herpes Simplex Encephalitis:**
-Acyclovir (Zovirax), 500 mg/m$^2$/dose IV q8h.

**Herpes Varicella Zoster**
-Acyclovir (Zovirax) 30 mg/kg/day IV over 60 min q8h for 10 days.

**Cytomegalovirus infections:**
-Ganciclovir (Cytovene) children >3 mo-adults: 10 mg/kg/dose IV over 1-2h q12h x 14-21d, maintenance 5 mg/kg/day IV qd or 6 mg/kg/dose IV five days weekly (do not combine with zidovudine).

**Active Pulmonary Tuberculosis:**
-Isoniazid 10-20 mg/kg/day qd-bid (max 300 mg/day) x 9 months after culture negative [tabs 100 mg, 300 mg; syrup 10 mg/ml] **AND**
-Rifampin 10-20 mg/kg/day PO qd-bid (max 600 mg/day) x 9 months after culture negative [capsules: 150, 300 mg] **AND**
-Ethambutol <12 y: 10-15 mg/kg/day PO qd; >12 y: 15-25 mg/kg/day PO qd (max 2500 mg/d) PO x 2 months (if extrapulmonary disease, use pyrazinamide instead) [tabs 100,400 mg] **OR**
-Pyrazinamide 20-40 mg/kg/day qd-bid (max 2000 mg per day) PO x 2 months [tab: 500 mg].

**Tuberculosis prophylaxis:**
-Isoniazid 10-20 mg/kg/day (max 300 mg/day) PO qd x 12 months [syrup 10 mg/ml; tab 50, 100, 300 mg] .

**Toxoplasmosis:**
-Pyrimethamine (Daraprim) 2 mg/kg/day (max 100 mg/d) PO q12h x 3 days, then 1 mg/kg/day (max 25 mg/day) PO qd indefinitely [tab: 25 mg] and folinic acid 5-10 mg/d PO qd **AND**
-Sulfadiazine 100 mg/kg/day PO tid-qid x 3-4 weeks, with ample fluids (max 8 g/day) [500 mg tab or extemporaneous suspension]

**Disseminated Histoplasmosis or Coccidiomycosis:**
-Amphotericin B 1 mg/kg/day IV qd over 2-4h x 8-12 weeks

**Mycobacterium Avium Complex (MAC)**
-Clarithromycin (Biaxin) 30 mg/kg/day PO q12h (max 1 g/day) [tab: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] **OR**
-Azithromycin (Zithromax) 10-20 my/kg/day PO qd, max 500 mg [cap: 250 mg; susp: 1 g packet] **AND**

-Ethambutol 15-25 mg/kg/day PO qd, max 1 gm [tab: 100, 400 mg] **OR**
-Rifabutin (>12 y) 450-600 mg/day PO qd-bid [cap: 150 mg] **OR**
-Rifampin 10-20 mg/kg/day PO q12-24h, max 600 mg/day [cap: 150, 300 mg; can make extemporaneous suspension].

Treatment regimen should include at least two drugs and should continue for the lifetime of the patient.

## Empiric Therapy of Lower Urinary Tract Infection

1. **Admit to:**
2. **Diagnosis:** UTI
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Lower Urinary Tract Infection:**

-TMP/SMX (Bactrim) 6-10 mg/kg/day TMP PO q12h, max 320 T/day [per 5 ml: Trimethoprim 40 mg, sulfamethoxazole 200 mg; single strength tab: 80 mg/400 mg; double strength tab: 160 mg/800 mg] **OR**
-Amoxicillin 30-40 mg/kg/day PO q8h x 7-10 days; max 3 g/day [tabs: 500; chew tabs: 125, 250 mg, caps: 250, 500 mg , susp: 125 mg/5 ml, 250 mg/5 ml] **OR**
-Loracarbef (Lorabid) 30 mg/kg/day PO q12h; max 800 mg/day [susp: 100 mg/5 ml, caps: 200 mg] **OR**
-Cefpodoxime (Vantin) 10 mg/kg/day PO q12h (max 200 mg/day) [susp: 50 mg/5 ml, 100 mg/5 ml; tabs: 100 mg, 200 mg] **OR**
-Cefprozil (Cefzil) 30 mg/kg/day PO q12h; max 1 g/day [susp: 125 mg/5 ml, 250 mg/5 ml; tabs: 250, 500 mg] **OR**
-Nitrofurantoin (Macrodantin) 5-7 mg/kg/day PO qid; max 400 mg/day [caps: 25, 50, 100 mg; susp: 25 mg/5 ml; tabs: 50,100 mg].

**Prophylactic Therapy:**

-Trimethoprim/SMX (Bactrim), 2 mg TMP/kg/day and 10 mg SMX/kg/day PO qhs [per 5 ml: Trimethoprim 40 mg, sulfamethoxazole 200 mg; single strength tab: 80 mg/400 mg; double strength tab: 160 mg/800 mg] **OR**
-Nitrofurantoin (Macrodantin) 1.2-2.4 mg/kg/day PO qhs [caps: 25, 50, 100 mg; susp: 25 mg/5 ml; tabs: 50,100 mg] **OR**
-Sulfisoxazole (Gantrisin) 50 mg/kg/day PO qhs [tab 500 mg; syrup 500 mg/5 ml].

10. **Symptomatic Medications:**
-Phenazopyridine (Pyridium), children 6-12 yrs: 12 mg/kg/day PO tid (max 200 mg/dose); >12 yrs: 200 mg PO tid prn dysuria [tabs: 100, 200 mg].
11. **Extras and X-rays:** Renal ultrasound. Voiding cystourethrogram 3 weeks after infection. Radiological work up on all children <1 year of age. If male >1 year, evaluate after second infection.
12. **Labs:** CBC, SMA 7. UA with micro, urine Gram stain, culture and sensitivity. Repeat urine culture and sensitivity 24-48 hours after therapy; blood culture and sensitivity.

# Pyelonephritis

1. **Admit to:**
2. **Diagnosis:** Pyelonephritis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
   -If less than 1 week old, see suspected sepsis, page 87.
   -Gentamicin or tobramycin (normal renal function):
   30 days-5 yr: 7.5 mg/kg/day IV/IM q8h.
   5-10 yr: 6.0 mg/kg/day IV/IM q8h.
   >10 yr: 5.0 mg/kg/day IV/IM q8h **AND EITHER**
   -Ampicillin 100 mg/kg/day IV/IM q6h, max 12 g/d **OR**
   -Trimethoprim/sulfamethoxazole (Septra, Bactrim) 5-8 mg of TMP/kg/24h IV/PO q12h (max dose 320 mg/24h); x 10d [per 5 ml: Trimethoprim 40 mg, sulfamethoxazole 200 mg; single strength tab: 80 mg/400 mg; double strength tab: 160 mg/800 mg] **OR**
   -Cefotaxime (Claforan) 100 mg/kg/day IV/IM q8h, max 12 g/d.
10. **Symptomatic Medications:**
    -Phenazopyridine (Pyridium), children 6-12 yrs: 12 mg/kg/day PO tid prn dysuria (max 200 mg/dose); >12 yrs: 200 mg PO tid prn dysuria [tabs 100, 200 mg].
11. **Extras and X-rays:** Renal ultrasound. Voiding cystourethrogram at completion of therapy.
12. **Labs:** CBC, SMA-7. UA with micro, urine, culture and sensitivity. Repeat urine culture and sensitivity 24-48 hours after therapy; blood culture and sensitivity; drug levels.

# Otitis Media

**Acute Otitis Media (S pneumoniae, non-typable H flu, M catarrhalis, Staph a, group A strep):**

-Treatment (10-14 days)
-Amoxicillin 30-40 mg/kg/day PO tid; max 3 g/day [tabs 125,250 mg; caps 250,500 mg; susp 125 mg/5 ml, 250 mg/5 ml] **OR**
-Trimethoprim/SMX (Bactrim, Septra) 6-8 mg/kg/day of TMP PO bid or 1 ml/kg/d PO divided bid; max 320 mg T/day [per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg] **OR**
-Erythromycin/Sulfisoxazole (Pediazole) 1 ml/kg/d or 40-50 mg/kg/day of erythromycin PO qid; max 50 ml/day [susp per 5 ml: erythromycin 200 mg/sulfisoxazole 600 mg]
**OR**
-Amoxicillin/clavulanate (Augmentin) 30-40 mg/kg/day of amoxicillin PO tid; max 2 g/day [tabs 250,500 may susp: 125 mg/5 ml, 250 mg/5 ml; chew tabs: 125, 250 mg] **OR**
-Clarithromycin (Biaxin) 15 mg/kg/day PO bid; max 1 g/day [tab: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] **OR**

-Cefixime (Suprax) 8 mg/kg/day PO bid-qd; max 400 mg/day [susp: 100 mg/5 ml; tab: 200, 400 mg] **OR**
-Cefuroxime axetil (Ceftin) <12 yrs: 125-250 mg PO bid; >12 yrs: 250-500 mg PO bid, max 1 g/day [tabs 125, 250, 500 mg] **OR**
-Loracarbef (Lorabid) 30 mg/kg/day PO bid; max 800 mg/day [susp: 100 mg/5 ml, caps: 200 mg] **OR**
-Cefpodoxime (Vantin) 10 mg/kg/day PO bid; max 800 mg/day [susp: 50 mg/5 ml, 100 mg/5 ml; tabs: 100 mg, 200 mg] **OR**
-Cefprozil (Cefzil) 30 mg/kg/day PO bid; max 1 g/day [susp: 125 mg/5 ml, 250 mg/5 ml; tabs: 250 mg, 500 mg] **OR**
-Ceftriaxone (Rocephin) one 50 mg/kg IM dose.

**Prophylactic Therapy (≥3 episodes in 6 months):**
-Sulfisoxazole (Gantrisin) 50 mg/kg/day PO qhs [tab 500 mg; susp 500 mg/5 ml] **OR**
-Amoxicillin 20 mg/kg/day PO qhs [caps: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] **OR**
-Trimethoprim/SMX 4 mg/kg/day of TMP PO qhs [per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg].

**Symptomatic Therapy:**
-Ibuprofen (Advil) 5-10 mg/kg PO q6-8 hrs [suspension: 100 mg/5 ml, tabs: 200, 300, 400, 600, 800 mg] **AND/OR**
-Acetaminophen (Tylenol) 10-15 mg/kg PO/PR q4h [tabs: 325, 500 mg; chewable tabs: 80 mg; caplets: 160 mg, 500 mg; drops: 80 mg/0.8 ml; elixir: 120 mg/5 ml, 130 mg/5 ml, 160 mg/5 ml, 325 mg/5 ml; caplet, ER: 650 mg; suppositories: 120,325,650 mg. ] **OR**
-Acetaminophen and codeine 0.5-1 mg codeine/kg/dose PO q4-6h prn pain [codeine 12 mg/5 ml].
-Benzocaine/antipyrine (Auralgan otic) fill canal and insert saturated pledget tid-qid prn pain x 2-3 days. Contraindicated in tympanic perforation.

**Extras and X rays:** Aspiration tympanocentesis, tympanogram; audiometry evaluation and testing. Unresponsive cases may require ENT consult for tympanostomy and tube placement.

## Otitis Externa

**Otitis Externa (Pseudomonas, gram neg, proteus):**
-Polymyxin B/neomycin/hydrocortisone (Cortisporin otic susp or solution) 2-4 drops in ear canal tid-qid x 5-7 days. If eardrum is perforated, use solution.

**Malignant Otitis Externa in Diabetes (Pseudomonas):**
-Ceftazidime (Fortaz) 100-150 mg/kg/day IV/IM q8h, max 12 g/d **OR**
-Piperacillin, ticarcillin, or azlocillin 200-300 mg/kg/day IV/IM q4-6h, max 24 g/day **OR**
-Tobramycin
30 days-5 yr: 7.5 mg/kg/day IV/IM q8h.
5-10 yr: 6.0 mg/kg/day IV/IM q8h.
>10 yr: 5.0 mg/kg/day IV q8h.

# Pharyngeal Infections

**Streptococcal Pharyngitis**

-Penicillin V 40 mg/kg/day PO qid x 10 days; max 2 g/day [tabs 125, 250, 500; susp 125 mg/5 ml, 250 mg/5 ml] **OR**

-Benzathine Penicillin (Bicillin) 25000 U/kg (max 1.2 mU) IM x 1 dose **OR**

-Erythromycin (penicillin allergic patients) 40 mg/kg/day PO qid x 10 days; max 2 g/day

erythromycin estolate
- susp: 125 mg/5 ml, 250 mg/ml
- chew tab: 125, 250 mg
- tab: 500 mg

erythromycin ethylsuccinate
- susp: 200 mg/5 ml, 400 mg/5 ml
- chew tab: 200 mg
- tab: 400 mg

erythromycin base
- tab: 250, 333, 500 mg **OR**

-Clarithromycin (Biaxin)15 mg/kg/day PO bid; max 1 g/day [tab 250, 500 mg tab; susp 125 mg/5 ml, 250 mg/5 ml.] **OR**

**Refractory Pharyngitis:**

-Amoxicillin/clavulanate (Augmentin) 40 mg/kg/day PO tid; max 2 g/day [tabs 250, 500; suspension 125 mg/5 ml, 250 mg/5 ml] **OR**

-Dicloxacillin 50-100 mg/kg/day PO qid; max 2 g/day [caps 125, 250, 500; elixir 62.5 mg/5 ml] **OR**

-Cephalexin (Keflex) 50 mg/kg/day PO qid-tid; max 4 g/day [caps 250, 500 mg; susp 125 mg/5 ml, 250 mg/5 ml] **OR**

-Clindamycin 30-40 mg/kg/day PO qid; max 1.8 g/day [caps: 75, 150, 300 mg; susp: 75 mg/5 ml]

**Prophylaxis (5 strep infection in 6 months):**

-Penicillin V 40 mg/kg/day PO bid [tabs 125, 250, 500 mg; susp 125 mg/5 ml, 250 mg/5 ml].

**Retropharyngeal Abscess or Cellulitis (strep, anaerobes, E corrodens):**

-Clindamycin 30-40 mg/kg/day IV/IM q6-8h, max 4.8 g/day **OR**

-Nafcillin 100-150 mg/kg/day IV/IM q6h, max 12 g/day **AND**

-Cefuroxime (Zinacef) 75-100 mg/kg/day IV/IM q8h, max 9 g/day

2. **Labs:** Throat culture, rapid antigen test; lateral and PA neck films; CXR. Otolaryngology consult for possible incision and drainage.

# Epiglottitis

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Epiglottitis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Pulse oximeter. Keep head of bed elevated, allow patient to sit; curved blade laryngoscope, tracheostomy tray and oropharyngeal tube at bedside. Avoid excessive manipulation or agitation. No examination of the pharynx. Do not draw blood or place IV lines. Respiratory isolation, pulse oximeter.

7. **Diet:** NPO
8. **IV Fluids:**
9. **Special Medications:**
   A definitive airway should be secured before manipulation of the patient.
   -Oxygen, humidified, blow-by; keep sat >92%.
   -Cool mist humidifier tent.

**Antibiotics (H flu type b, S. pneumoniae):**
   -Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/day **OR**
   -Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6-8h, max 12 g/day

10. **Extras and X-rays:** CXR PA and LAT, lateral neck (Pancoast soft tissue). Otolaryngology consult.
11. **Labs:** CBC, CBG/ABG. Blood and throat culture and sensitivity, latex agglutination; UA, culture and sensitivity. Urine antigen screen.

## Sinusitis

**1. Treatment of Sinusitis (S. pneumoniae, H flu, M catarrhalis, gp A strep, anaerobes):**
   -Treat for 21 days.
   -Amoxicillin 40 mg/kg/day PO tid; max 3 g/day [tabs 125, 250, 500 mg; susp 125 mg/5 ml, 250 mg/5 ml] **OR**
   -Trimethoprim/SMX (Bactrim, Septra) 6-8 mg/kg/day of TMP PO bid [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg] **OR**
   -Amoxicillin/clavulanate (Augmentin) 40 mg/kg/day of amoxicillin PO tid; max 2 g/day [tabs 250, 500 mg; chew tabs: 125, 250 mg; susp 125 mg/5 ml, 250 mg/5 ml] **OR**
   -Cefuroxime axetil (Ceftin) <2 y: 125 mg PO bid; 2-12 yrs: 250 mg PO bid; 30 mg/kg/day PO bid, >12 yrs: 250-500 mg PO bid, max 500 mg/dose [susp: 125 mg/5 ml; tabs 250, 500 mg] **OR**
   -Clarithromycin (Biaxin)15 mg/kg/day PO bid; max 1 g/day [susp 125 mg/5 ml, 250 mg/5 ml; tab 250, 500 mg]
2. **Labs:** Sinus x-rays. CBC.

## Active Pulmonary Tuberculosis

1. **Admit to:**
2. **Diagnosis:** Active Pulmonary Tuberculosis
3. **Condition:**
4. **Vital signs:**
5. **Activity:**
6. **Nursing:** Respiratory isolation.
7. **Diet:**
8. **Special Medications:**

**Pulmonary Infection (including hilar adenopathy):**

**6 Month Regimen:** Two months of isoniazid, rifampin, and pyrazinamide daily, followed by 4 months of isoniazid and rifampin daily **OR**
Two months of isoniazid, rifampin, and pyrazinamide daily followed by 4 months of isoniazid and rifampin twice weekly.

**9 Month Regimen (alternative):** Nine months of isoniazid and rifampin daily **OR** one month of isoniazid and rifampin daily, followed by 8 months of isoniazid

and rifampin twice weekly.

**Anti-tuberculosis Agents:**

-Isoniazid: 10-15 mg/kg/day PO qd, max 300 mg.
Twice weekly dose: 20-30 mg/kg PO, max 900 mg [tab: 50, 100, 300 mg; syr: 10 mg/ml].

-Rifampin: 10-20 mg/kg/day PO qd, max 600 mg
Twice weekly dose: 10-20 mg/kg/dose PO, max 600 mg [caps: 150, 300 mg, can make suspension].

-Pyrazinamide, daily dose: 20-40 mg/kg PO qd; or twice weekly: 50 mg/kg, max 2000 mg [EP susp, tab 500 mg].

-Ethambutol 15 mg/kg/day PO qd [tab: 100, 400 mg].

-Streptomycin 20-40 mg/kg IM once daily or twice weekly under direct observation (max 1,000 mg/dose). [inj: 400 mg/ml] Drug only available from Pfizer on a patient-by-patient basis. Call 1-800-254-4445.

**Tuberculosis Prophylaxis for skin test conversion (Positive PPD, no disease):**

-Isoniazid-susceptible, 10 mg/kg/day (max 300 mg) PO qd x 9 months.

-Isoniazid-resistant: Rifampin, 10 mg/kg/day PO qd (max 600 mg) for 9 months.

-Directly observed therapy should be considered for all patients. All household contacts should be tested.

9. **Extras and X-rays:** CXR PA, LAT, spinal series, ECG.
10. **Labs:** CBC, SMA7, liver panel, HIV antibody, ABG. First AM sputum for AFB x 3 (drug sensitivity tests on first isolate). Gastric aspirates for AFB qAM x 3. UA, urine AFB.

## Cellulitis

1. **Admit to:**
2. **Diagnosis:** Cellulitis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Keep affected extremity elevated; warm compresses qid prn.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Scalded Skin Syndrome, Impetigo, Staphylococcal Scarlet Fever:**

-Oxacillin or Nafcillin 100-200 mg/kg/day IV/IM q4-6h; max 12 g/d **OR**

-Dicloxacillin (after response to IV Tx) 25-50 mg/kg/day PO qid x 5-7d; max 2 g/day [caps 125,250,500 mg; elixir 62.5 mg/5 ml] **OR**

-Cephalexin (Keflex) 25-50 mg/kg/day PO qid; max 4 g/day [caps: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] **OR**

-Loracarbef (Lorabid) 30 mg/kg/day PO bid; max 800 mg/day [susp: 100 mg/5 ml, caps: 200 mg pavules] **OR**

-Cefpodoxime (Vantin) 10 mg/kg/day PO bid; max 800 mg/day [susp: 50 mg/5 ml, 100 mg/5 ml; tabs: 100 mg, 200 mg] **OR**

-Cefprozil (Cefzil) 30 mg/kg/day PO bid; max 1 g/day [susp 125 mg/5 ml, 250 mg/5 ml; tabs 250 mg, 500 mg] **OR**

-Mupirocin (Bactroban) gel, apply topically tid. Extensive involvement requires systemic antibiotics.

**Empiric Therapy for Extremity Cellulitis:**

-Nafcillin or Oxacillin 100-200 mg/kg/day/IV/IM q4-6h, max 12 g/d **OR**
-Cefazolin (Ancef) 75-100 mg/kg/day IV/IM q6-8h, max 6 g/d **OR**
-Cefoxitin (Mefoxin) 100-150 mg/kg/day IV/IM q6h, max 12 g/d **OR**
-Ticarcillin/clavulanate (Timentin) 200-300 mg/kg/day IV/IM q4-6h, max 18 g/d **OR**
-Dicloxacillin 50-100 mg/kg/day PO qid; max 2 g/day [caps 125,250,500; elixir 62.5 mg/5 ml].

**Cheek/Buccal Cellulitis (H flu):**
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/d **OR**
-Cefotaxime (Claforan) 100-150 mg/kg/day IV/IM q6-8h, max 12 g/d

**Periorbital Cellulitis (H. flu, pneumococcus; consider lumbar puncture, especially in unimmunized children):**
-Cefuroxime (Zinacef) 100-150 mg/kg/day IV/IM q8h, max 9 g/d

**10. Symptomatic Medications:**
-Acetaminophen and codeine, 0.5-1 mg codeine/kg/dose PO q4-6h prn pain [codeine 12 mg/5 ml].

**11. Extras and X-rays:** X-ray views of site.

**12. Labs:** CBC, SMA 7, blood culture and sensitivity. Leading edge aspirate, drainage fluid for Gram stain, culture and sensitivity; UA, urine culture and sensitivity.

## Tetanus

**History of One or Two Primary Immunizations or Unknown:**
Low risk wound - Tetanus toxoid 0.5 ml IM.
Tetanus prone - Tetanus toxoid 0.5 ml IM plus tetanus immunoglobulin (TIG) 250 U IM.

**Three Primary Immunizations and 10 yrs or more since last Booster:**
Low risk wound - Tetanus toxoid, 0.5 ml IM.
Tetanus prone - Tetanus toxoid, 0.5 ml IM.

**Three Primary and 5-10 yrs since last Booster:**
Low risk wound - None
Tetanus prone - Tetanus toxoid, 0.5 ml IM.

**Three Primary and ≤5 yrs since last Booster:**
Low risk wound - None
Tetanus prone - None

**Treatment of Clostridium Tetani Infection:**
-Tetanus immune globulin (TIG), single dose of 3,000 to 6,000 u IM.
-Part of the dose may be infiltrated locally around the wound. Keep wound clean and dÉbrided.
-Penicillin G 100,000 u/kg/day IV q4-6h, max 24 MU/day x 10-14 days.

# Pelvic Inflammatory Disease

1. **Admit to:**
2. **Diagnosis:** Pelvic Inflammatory Disease
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:**
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Adolescent Outpatients**

-Ceftriaxone (Rocephin) 250 mg IM once and doxycycline 100 mg PO bid for 14 days **OR**

-Cefoxitin (Mefoxin) 2 gm IM, with probenecid 1 gm PO and doxycycline (Vibramycin) 100 mg PO bid x 10-14d

Patients older than 18 years may be given ofloxacin 400 mg PO bid plus clindamycin 450 mg PO qid or metronidazole 500 mg PO bid.

**Adolescent Inpatients**

-Cefoxitin (Mefoxin) 2 gm IV q6h **OR**

-Cefotetan 2 gm IV q12h **AND**

-Doxycycline (Vibramycin) 100 mg IV/PO q12h (IV for 4 days and 48h after afebrile, then complete 10-14 days of doxycycline 100 mg PO bid) [caps: 50,100 mg; tabs: 50,100 mg; susp: 5 mg/ml, 10 mg/ml] **OR**

-Clindamycin 900 mg IV q8h plus gentamicin 2 mg/kg IV loading dose followed by 1.5 mg/kg IV q8h. Continue for 48h after significant clinical improvement, followed by doxycycline 100 mg PO bid or clindamycin 450 mg PO q6h to complete 14 days of treatment.

**Gonorrhea in Children less than 45 kg:**

-Ceftriaxone (Rocephin) 125 mg IM x 1 dose (uncomplicated disease only) **OR** 50-75 mg/kg/day IV/IM q24h (If ophthalmia, peritonitis, bacteremia, or arthritis, treat for 7 days) **OR**

-Spectinomycin 40 mg/kg IM (max 2 g) x 1 dose **OR**

-Amoxicillin 50 mg/kg PO once plus probenecid 25 mg/kg PO once (max 1 gm).

10. **Symptomatic Medications:**

-Acetaminophen (Tylenol) 10-15 mg/kg/dose PO/PR q4-6h prn.

11. **Extras and X-rays:** Pelvic ultrasound; social services consult.
12. **Labs:** CBC, SMA 7 and 12, ESR. GC and chlamydia culture, RPR or VDRL. UA with micro; serum beta HCG or urine pregnancy test.

# Pediculosis (Lice)

**Treatment:**

Disinfect clothing or bedding used in last 48 hours with hot water machine washing and drying, or dry clean.

For eyelash infestation, apply petrolatum ointment bid for 8-10 days. Use nit comb to remove nits.

**5% Permethrin (Elimite) - cream (very effective):** Adults and children: Massage cream into skin from head to soles of feet. Remove by washing after 8 to 14 hours. Treat infants on scalp, temple and forehead. One application is usually curative.

**1% Lindane (Kwell, Gamma benzene) - (cream, lotion, shampoo):** Treatment of pediculosis: apply lotion or cream to the affected hairy and adjacent areas; avoid contact with eyes or mucous membranes. After 8-12 hours, wash with soap and water. 1% lindane shampoo may be used for head or pubic lice. Apply 15-30 ml of shampoo and lather for 4-5 minutes. Rinse hair with water, fine tooth comb remaining nits. Do not use shampoo for eyelash treatment. First treatment with lindane is usually successful. Treatment may be repeated after one week if live lice or nits remain. Contraindicated in children <2 years of age.

# Scabies

**Treatment:**

Bathe with soap and water; scrub and remove scaling or crusted detritus; towel dry. All clothing and bed linen contaminated within past 2 days should be hot water washed and heat dried for 20 min or dry cleaned.

**1% Lindane (Kwell, Gamma benzene) - available as cream, lotion:**

Use 1% lindane for adults and older children; not recommended in pregnancy, infants, or excoriated skin. 1-2 treatments is usually effective. Massage a thin layer from neck to toes (including soles). In adults, 20-30 g of cream or lotion is sufficient for 1 application. Bathe after 8-12 hours. May be repeated in one week if mites remain or new lesions appear. Contraindicated in children <2 years of age.

**5% Permethrin (Elimite) - cream (very effective):** Adults and children: Massage cream into skin from head to soles of feet. Remove by washing after 8 to 14 hours. Treat infants on scalp, temple and forehead. One application is usually curative.

# Dermatophytoses

**Diagnostic procedures:**

(1) KOH press of scales and skin scrapings for hyphae.
(2) Cultures for uncertain cases.

**Treatment**

**Tinea corporis, cruris, pedis:**

Topical Tinactin or clotrimazole tid until completely clean, then additional 1-2 weeks of therapy.

**Tinea capitis:**

Griseofulvin Microsize 10-20 mg/kg/day PO qd-bid (max 1,000 mg/day) [tab: 250, 500 mg; cap: 125, 250 mg; susp: 125 mg/5 ml]

Griseofulvin Ultramicrosize 5.5-7.3 mg/kg/day PO qd-bid (max 750 mg/day) [tab: 125, 165, 250, 330 mg]. Give with whole-milk or fatty foods (e.g. ice cream, peanuts) to increase absorption. May require 4-8 weeks of therapy.

**Tinea of the Nails**: Griseofulvin: (see above) may require up to 4 mo of therapy.

**Tinea Versicolor**:

Selenium sulfide lotion or Tinactin cream. Apply to skin for 15 min, let dry, wash off. Use daily x 2-4 weeks. May need to use 1-2 times per week to prevent relapse.

# *Gastroenterology*

## Gastroenteritis and Diarrhea

1. **Admit to:**
2. **Diagnosis:** Acute Gastroenteritis
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights, urine specific gravity.
7. **Diet:** Rehydralyte, Pedialyte or soy formula (Isomil DF), or bland diet.
8. **IV Fluids:** See Dehydration page 124.
9. **Special Medications:**

**Severe Gastroenteritis with Fever, gross blood and neutrophils in stool, C. jejuni, E coli, Shigella, Salmonella):**

-Trimethoprim/SMX (not effective against Campylobacter jejuni) 10 mg of TMP component kg/d PO bid x 5-7d [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg].

**Antibiotic Associated Diarrhea and Pseudomembranous Colitis; (Clostridium difficile):**

-Metronidazole (Flagyl) 20-30 mg/kg/day PO/IV q8h x 7 days (max 4 g/d). [tab: 250, 500 mg; can make extemporaneous oral suspension.]

-Vancomycin 10-40 mg/kg/day PO qid x 7 days, max 2 g/d [caps: 125, 250 mg; oral soln: 250 mg/5 ml, 500 mg/6 ml] **OR**

**Salmonella (treat infants and patients with septicemia):**

-Ampicillin 100-200 mg/kg/day IV q6h, max 12 g/d or 50-80 mg/kg/day PO qid x 5-7d [caps: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml] **OR**

-Trimethoprim/SMX 10 mg TMP/kg/day PO bid x 5-7d [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg] **OR**

-Ciprofloxacin (>18 yrs) 20-30 mg/kg/day PO bid (max 1.5 g/day) [tabs: 250, 500, 750 mg].

**Rotavirus, for supportive treatment see Dehydration page 124.**

**Symptomatic Meds for acute, noninfectious gastroenteritis and diarrhea:**

-Kaolin with pectin (Kaopectate), 3-6 yrs: 15-30 ml/dose; 6-12 yrs: 30-60 ml/dose; >12 y: 60-120 ml/dose after each loose BM or q3-4h prn **OR**

-Loperamide (Imodium)
2-6 y: 1 mg PO tid prn
6-8 y: 2 mg PO bid prn
8-12 y: 2 mg PO tid prn
>12 y: 4 mg PO x 1, then 2 mg PO with each loose stool (max 16 mg/day) [syr: 1 mg/5 ml, tab: 2 mg; cap: 2 mg] **OR**

-Diphenoxylate with atropine (Lomotil) >2 y: 0.3-0.4 mg diphenoxylate component/kg/day PO bid-qid prn (max 15 mg/day) [per 5 ml or tab: diphenoxylate 2.5 mg and atropine 0.025 mg] **OR**

-Bismuth subsalicylate (Pepto Bismol): (Note - if using extra strength liquid, only use ½ amount)
3-6 yr: 5 ml or ⅓ tab PO tid-qid.
6-9 yr: 10 ml or ⅔ tab PO tid-qid.
9-12 yr: 15 ml or 1 tab PO tid-qid
>12 yr: 30 ml or 2 tabs PO tid-qid.

[chew tabs 262 mg; liquid 262 mg/15 ml; extra-strength liquid: 524 mg/15 ml]

**11. Extras and X-rays:** Upright abdomen

**12. Labs:** SMA7, CBC; stool Wright stain for leukocytes, rotazyme. Stool culture and sensitivity enteric pathogens; C difficile toxin and culture, ova and parasites; occult blood. Urine specific gravity, UA, blood culture and sensitivity.

## Specific Therapy of Gastroenteritis

**Shigella Sonnei:**

-Trimethoprim/SMX, 10 mg TMP/kg/day PO/IV q12h x 5 d [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg].

-Ampicillin (susceptible strains) 50-80 mg/kg/day PO q6h x 5-7 day or 100 mg/kg/day IV/IM q6h, max 12 g/day [caps: 250, 500 mg; susp: 125 mg/5 ml, 250 mg/5 ml]

**Yersinia (sepsis):**

-TMP/SMX 10 mg/kg/day TMP PO q12h x 5-7d [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg]

**Campylobacter jejuni:**

-Erythromycin 40 mg/kg/day PO q6h x 5-7 days; max 2 g/day.

erythromycin estolate
- susp: 125 mg/5 ml, 250 mg/ml
- chew tab: 125, 250 mg
- tab: 500 mg

erythromycin ethylsuccinate
- susp: 200 mg/5 ml, 400 mg/5 ml
- chew tab: 200 mg
- tab: 400 mg

erythromycin base
- tab: 250, 333, 500 mg **OR**

-Tetracycline (**>8 yrs only**) 20-30 mg/kg/day IV q8-12h or 25-50 mg/kg/day PO q6h x 14-21 days [caps: 100, 250, 500 mg; tabs: 250, 500 mg, susp: 125 mg/5 ml; inj: 250, 500 mg]

**Helicobacter pylori infections:**

-Bismuth subsalicylate (Pepto Bismol) 10 ml/PO tid.

3-6 y: ⅛ tablet or 5 ml regular strength liquid PO qid
6-9 y: ⅔ tablet or 10 ml regular strength liquid PO qid
9-12 y: 1 tablet or 15 ml regular strength liquid PO qid
>12 y: 2 tablets or 30 ml regular strength liquid PO qid or 15 ml extra strength liquid PO qid.

Tab, chew: 262 mg
Liquid: 262 mg/15 ml
Liquid, extra strength: 524 mg/15 ml

**Plus:** Amoxicillin 40 mg/kg/day PO q8h, max 3 g/day [tabs 250, 500 mg, susp 125 mg/5 ml, 250 mg/5 ml]

**Plus**: Metronidazole (Flagyl) 30 mg/kg/day PO q8h; max 500 mg/dose [tab: 250, 500 mg; can make extemporaneous oral suspension], max 500 mg/dose.

If >12 yr, may substitute tetracycline for amoxicillin using 25-50 mg/kg/day PO q6h (max 500 mg/dose). [caps: 100, 250, 500 mg; tab: 200, 500, mg; susp: 125 mg/5 ml]

Treat for 2 weeks.

**Enteropathogenic E. coli (Travelers Diarrhea):**

-Trimethoprim/SMX 10 mg/kg/day TMP PO/IV bid [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg] **OR**

-Neomycin 100 mg/kg/day PO q6-8h [tab: 500 mg; oral soln: 125 mg/5 ml].

**OR IF >8 y:** Doxycycline (Vibramycin) 100 mg PO qd [caps: 50, 100 mg; tab: 50, 100 mg; susp: 5 mg/ml, 10 mg/ml].

**Enteroinvasive E coli:**

-Trimethoprim/SMX 10 mg/kg/day TMP PO/IV q12h [susp per 5 ml: 40 mg/200 mg; SS tab: 80 mg/400 mg; DS tab: 160 mg/800 mg]

**Giardia Lamblia:**

-Quinacrine hydrochloride 6 mg/kg/day PO q8h x 5d (max 300 mg/day) [tab: 100 mg] **OR**

-Metronidazole (Flagyl) 15 mg/kg/day PO q8h x 4 days [tab: 250, 500 mg; can make extemporaneous oral suspension.] **OR**

-Furazolidone 5-10 mg/kg/day PO qid, max 100 mg/dose [tab: 100 mg; liquid: 50 mg/15 ml].

**Entamoeba Histolytica:**

**Asymptomatic cyst carriers:**

-Iodoquinol: 40 mg/kg/day PO q8h (max 2 gm/day) x 20 days) [tab: 210 mg, 650 mg; powder for reconstitution] **OR** Paromomycin: 30 mg/kg/day PO q8h x 7-10 days [cap 250 mg] **OR** Diloxanide: 20 mg/kg/day PO q8h x 10 days. [Presently available only through CDC.]

**Mild to moderate intestinal symptoms with no dysentery:**

-Metronidazole: 35-50 mg/kg/day PO q8h x 10 days, max 4 g/d [tab: 250, 500 mg; can make extemporaneous oral suspension] followed by iodoquinol 40 mg/kg/day q8h for 20 days **OR**

-Paromomycin: 30 mg/kg/day PO q8h x 7-10 days [cap 250 mg] .

**Dysentery or extraintestinal disease (including liver abscess):**

-Metronidazole: 35-50 mg/kg/day PO q8h x 10 days [tab: 250, 500 mg; can make extemporaneous oral suspension.] Followed by:

-Iodoquinol: 40 mg/kg/day PO q8h x 20 days (max 2 gm/day) [tab: 210, 650 mg; powder for reconstitution] **OR**

-Dehydroemetine (only available through CDC) 1.0-1.5 mg/kg/day (max 90 mg) IM divided q12h x 5 days, followed by chloroquine 10 mg base/kg/d (max 300 mg) PO x 14-21d **plus** iodoquinol or paromomycin, as above.

**Severe Colitis:**

-Metronidazole 35-70 mg/kg/day PO/IV tid x 10 days **OR**

-Dehydroemetine (only available through CDC) 1.0-1.5 mg/kg/day (max 90 mg) IM bid x 5 days

-Either drug followed by: iodoquinol or paromomycin, as above.

## Ulcerative Colitis

1. **Admit to:**
2. **Diagnosis:** Ulcerative colitis.
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Daily weights, inputs and outputs.

7. **Diet:** NPO except for ice chips, no milk products.
8. **IV Fluids:**
9. **Special Medications:**
   -Sulfasalazine (Azulfidine), children >2 yrs:
   Severe to moderate disease: 50-75 mg/kg/day PO q4-6h, max 6 gm/day.
   Mild disease: 40-50 mg/kg/day PO q6h.
   Maintenance therapy: 30-50 mg/kg/day PO q4-8h, max 2 gm/day.
   [susp: 50 mg/ml; tab: 500 mg; tab, EC: 500 mg] **OR**
   -Olsalazine sodium (Dipentum) >12 yrs: 500 mg PO with food bid [caps 250 mg].
   -Hydrocortisone retention enema 100 mg PR qhs **OR**
   -Hydrocortisone acetate 90 mg aerosol foam susp PR qd-bid or 25 mg supp PR bid.
   -Prednisone 1-2 mg/kg/day PO qAM or bid (max 40-60 mg/day).

**Other Medications:**
   -Vitamin B12 100 mcg IM qd 5d then 100-200 mcg IM q month.
   -Multivitamin PO qAM or 1 ampule IV qAM.
   -Folic acid 1 mg PO qd.

10. **Extras and X-rays:** Upright abdomen, Surgical, GI, dietetics consults.
11. **Labs:** CBC, platelets, SMA 7, Mg, ionized calcium; liver panel, blood culture and sensitivity x 2. Stool culture and sensitivity for enteric pathogens, ova and parasites, C. differential toxin, Wright's stain.

## Parenteral Nutrition

1. **Admit to:**
2. **Diagnosis:**
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Nursing:** Daily weights, inputs and outputs; measure head circumference and height. Finger stick glucose bid when stable.
6. **Diet:**

**Central Parenteral Nutrition**:
   -Calculate daily protein solution fluid requirement less fluid from lipid and other sources. Calculate total amino acid requirement.
   -Protein: Neonates and infants start with 0.5 gm/kg/d and increase 0.5-1.0 gm/kg/d (max 10-12% of total calories/d). For children and young adults start with 1 gm/kg/d and increase by 1.0 gm/kg/d (max 2-3 gm/kg/d). Calculate percent amino acid to be infused: amino acid requirement divided by the volume of fluid from protein solution x 100.
   -May advance daily dextrose concentration as tolerated while following blood glucose levels. Maximum dextrose concentration is usually 35% dextrose in water.

**TPN Requirements:**

| | Infants-25 kg | 25-45 kg | >45 kg |
|---|---|---|---|
| Calories | 90-120 Kcal/kg/day | 60-105 Kcal/kg/day | 40-75 Kcal/kg/day |
| Fluid | 120-180 ml/kg/day | 120-150 ml/kg/day | 50-75 ml/kg/day |
| Dextrose | 4-6 mg/kg/min | 7-8 mg/kg/min | 7-8 mg/kg/min |
| Protein | 2-3 gm/kg/day | 1.5-2.5 gm/kg/day | 0.8-2.0 gm/kg/day |
| Sodium | 2-6 mEq/kg/day | 2-6 mEq/kg/day | 60-150 mEq/day |
| Potassium | 2-5 mEq/kg/day | 2-5 mEq/kg/day | 70-150 mEq/day |
| Chloride | 2-3 mEq/kg/day | 2-3 mEq/kg/day | 2-3 mEq/kg/day |
| Calcium | 1-2 mEq/kg/day | 1 mEq/kg/day | 0.2-0.3 mEq/kg/day |
| Phosphate | 0.5-1 mMol/kg/day | 0.5 mMol/kg/day | 7-10 mm l/1000 cal |
| Magnesium | 1-2 mEq/kg/day | 1 mEq/kg/day | 0.35-0.45 mEq/kg/day |
| Multi-Trace Element Formula | 1 ml/day | 1 ml/d | 1 ml/day |
| Insulin and Acetate, if indicated. | | | |

**Multivitamin (MVI or MVC 9+3):**

| | |
|---|---|
| <1 kg | 1.5 ml/day Peds MVI |
| 1-3 kg | 3.3 ml/day Peds MVI |
| 3 kg-11 yrs | 5 ml/day Peds MVI |
| >11 yrs | MVC 9+3 10 ml/day |

**Dextrose Infusion:**

Dextrose mg/kg/min = (% Dextrose x rate (ml/h) x 0.167) ÷ kg

Normal Starting Rate: 6-8 mg/kg/min

**Lipid Solution:**

- -Minimum of 5% of total calories should be from fat emulsion. Max of 40% of calories as fat (10% sln = 1 gm/10 ml = 1.1 Kcal/ml; 20% sln = 2 gm/10 ml = 2.0 Kcal/ml).
- -Neonates begin fat emulsion with 0.5 gm/kg/d and advance 0.5-1 g/kg/d.
- -For infants, children and young adults begin at 1 g/kg/d, advance as tolerated by 0.5-1 g/kg/d; max 3 g/kg/d or 40% of calories/day.
- -Neonates - infuse over 20-24h; children and infants - infuse over 16-24h, max 0.15 gm/kg/h.
- -Serum triglyceride 6h after infusion (maintain <200 mg/dL)

**Peripheral Parenteral Supplementation**:

- -Calculate daily fluid requirement less fluid from lipid and other sources. Then calculate protein requirements: 1 gm/kg/day. Advance daily protein by 0.5-0.6 gm/kg/day until 3 gm/kg/day; monitor BUN/creatinine. Calculate percent protein to meet parenteral protein requirements:
- -Protein requirement ÷ Fluid requirement x 100 = % amino acids.
- -Begin with maximum tolerated dextrose concentration (Dextrose concentration >12.5% requires a central line).
- -Calculate max fat emulsion intake (3 gm/kg/day), and calculate vol of 20% fat required (20 gm/100 ml = 20 %):
  (weight (kg) x gm/kg/day) ÷ 20 x 100 = ml of 20% fat emulsion.
  Start with 0.5-1.0 gm/kg/day lipid and increase by 0.5-1.0 gm/kg/day until 3 gm/kg/day. Deliver over 18-24 hours.
- -Draw blood 4-6h after end of infusion for triglyceride.

8. **Extras and X-rays**: CXR, plain film for line placement, dietician consult.
9. **Labs:**

   **Daily labs** - Glucose, Na, K, Cl, $HCO_3$, BUN, OSM, CBC, cholesterol, triglyceride, urine glucose and specific gravity.

   **Twice weekly Labs** - Calcium, phosphate, Mg, SMA-12

   **Weekly Labs** - Protein, albumin, prealbumin, Mg, direct and indirect bilirubin, AST, GGT, alkaline phosphatase, iron, TIBC, transferrin, retinol-binding protein, PT/PTT, zinc, copper, B12, folate, 24h urine nitrogen and creatinine.

**Peds Nutrition Panel I:** Electrolytes, glucose calcium, phosphate.
**Panel II:** Panel I and Mg, BUN, creatinine, albumin, triglycerides, AST (SGPT).

## Gastroesophageal Reflux

1. **Treatment:**
   -Thicken feedings; give small volume feedings; keep child prone with head of bed elevated 30 degrees.
   -Metoclopramide (Reglan) 0.1-0.2 mg/kg/dose PO qid 20-30 minutes prior to feedings (max 1 mg/kg/day) syrup 1 mg/ml, tab 5,10 mg; concentrated soln: 10 mg/ml] **OR**
   -Cisapride (Propulsid) 0.15-0.3 mg/kg/dose PO tid-qid [10 mg scored tab; susp: 1 mg/ml] **OR**
   -Cimetidine (Tagamet) 20-40 mg/kg/day IV/PO q6h (20-30 min before feeding) [oral soln: 60 mg/ml; tabs 200, 300,400,800 mg, inj: 150 mg/ml] **OR**
   -Ranitidine (Zantac) 2-3 mg/kg/day IV q8h or in TPN or 4-6 mg/kg/day PO q12h [tabs 150,300 mg; liquid 15 mg/ml; inj 50 mg/ml.]
2. **Extras and X-rays:** Upper GI series; gastroesophageal nuclear scintigraphy (milk scan), endoscopy.

## Constipation

**Treatment:**
1. **Child < 2 years of Age:**
   Glycerine suppository
   Dilation with a lubricated rectal thermometer or finger dilation is usually all that is needed in this age group.
2. **Increase Bulk and Soften the Stool**, increase free water intake and use natural dietary lubricants (e.g., prune juice, olive oil, tomatoes, and tomato juice). In addition, high-residue foods (e.g., fruits and green vegetables) and the addition of bran and whole grain products are optimal for lifelong dietary changes.
3. **Child >2 years of Age:**
   (1) Glycerine or bisacodyl (Dulcolax) suppository (one only)
   (2) Pediatric Fleet's enema (can be repeated once)
   (3) Mineral oil 15 ml PO.
   (4) Manual disimpaction may be necessary.
4. **Stool Softeners and Laxatives:**
   -Docusate sodium (Colace):

| | |
|---|---|
| <3y | 10-40 mg/day PO q6-24h |
| 3-6y | 20-60 mg/day PO q6-24h |
| 6-12y | 40-150 mg/day PO q6-24h |
| >12y | 50-400 mg/day PO q6-24h |

   [oral soln 10 mg/ml, 50 mg/ml; caps 50,100,250 mg]
   -Mineral oil:

| | |
|---|---|
| 5-11y | 5-20 ml PO qd |
| >12y | 15-45 ml PO qd |

   -Magnesium Hydroxide (Milk of Magnesia) 0.5 ml/kg/dose or 2-5 y: 5-15 ml; 6-12y: 15-30 ml; >12y: 30-60 ml PO prn.

-Phosphosoda enemas (Fleet's enema). May repeat once.
-Hyperosmotic Soln (CoLyte or GoLytely) 15-20 ml/kg/h PO/NG until bowel is clear.

4. **Diagnostic Evaluation:** Anorectal manometry, potassium, calcium, thyroid panel. Hirschsprung's barium biopsy.
5. **Pre-operative bowel antisepsis:**
-Neomycin 25 mg/kg/dose PO q4h x 3 doses
[oral soln: 125 mg/5 ml; tab: 500 mg] **AND**
-Erythromycin 20 mg/kg/dose PO q4h x 3 doses **AND**
-Colonic lavage solution (CoLyte or GoLytely) 20-40 ml/kg/hr PO/NG until rectal effluent is clear.

# *Toxicology*

## Poisoning

**Decontamination:**

**Activated Charcoal:** 1 gm/kg/dose (max 50 gm) PO/NG, first dose should be given using product containing sorbitol as cathartic then switch to aqueous product. Repeat ½ of initial dose q4h if indicated.

**Gastric Lavage:** Left side down, with head slightly lower than body; place large-bore orogastric tube and check position by injecting air and auscultating. Normal saline lavage: 15 ml/kg boluses until clear fluid (max 200-400 ml in adults), then give activated charcoal or other antidote prn. Save initial aspirate for toxicological exam. Gastric lavage is contraindicated if corrosives, hydrocarbons, or sharp objects were ingested.

**Cathartics:**

-Magnesium citrate 6% sln:
<6 yrs: 2-4 ml/kg/dose PO/NG
6-12 yrs: 100-150 ml PO/NG
>12 yrs: 150-300 ml PO/NG

## Antidotes to Common Poisonings

**Cyanide:**

-Amyl Nitrite, inhale ampule contents for 30 seconds q1min until sodium nitrite is administered. Use new amp q3min **AND**

-Sodium Nitrite, 3% inj sln, 0.33 ml/kg (max 10 ml) IV over at least 5min. Repeat ½ dose 30 min later if inadequate clinical response

**Followed By:**

-Sodium Thiosulfate, 1.65 ml/kg of 25% sln (max 50 ml) IV, repeat ½ dose 30min later if inadequate clinical response.

**Cyanide Antidote Kit:**

Contains: Sodium nitrite 300 mg in 10 ml (2 amps)
Sodium thiosulfate 12.5 gm in 50 ml (2 amps)
Amyl nitrite inhalant 0.3 ml (12 aspirols)
Also disposable syringes, stomach tube, and tourniquet.

**Narcotic or Propoxyphene Overdose:**

-Naloxone hydrochloride (Narcan) 0.1 mg/kg/dose, max 4 mg IV/IO/ET/IM/IO, may repeat q2min.

**Methanol or Ethylene Glycol Overdose:**

-Ethanol 7-10 ml/kg (10% inj sln) IV over 30min, then 0.8-1.4 ml/kg/hr. Maintain ethanol level at 100-150 mg/dL.

**Carbon Monoxide:**

-Oxygen 100% or hyperbaric oxygen if available.

**Phenothiazine Reaction (Extrapyramidal Reaction):**

-Diphenhydramine (Benadryl) 1 mg/kg IV/IM q6h x 4 doses; max 50 mg/dose; followed by 5 mg/kg/day PO q6h for 2-3 days.

**Digoxin Overdose:**

-Digibind (Digoxin immune Fab). Dose (# of 40 mg vials) = post-distribution digoxin level in ng/ml x body wt (kg)/100 **OR**

-Dose (mg) = mg of digoxin ingested x 0.8 x 66.7

**Benzodiazepine Overdose:**

-Flumazenil (Romazicon) 0.01 mg/kg IV (0.1 mg/ml in 5 ml and 10 ml vials). May need to repeat dose if patient becomes symptomatic again.

**Alcohol Overdose:** Cardiorespiratory support

Labs: Blood sugar; CBC, panel, ABG, rapid toxicology screen.

Treatment: Dextrose 50% 1 gm/kg = 4 ml/kg (max 50 ml).

Naloxone 0.1 mg/kg (max 2 mg) IV, repeat q2min prn to max dose 8-10 mg if drug overdose suspected. For extreme agitation, give diazepam 0.1-0.3 mg/kg IV.

## Acetaminophen Overdose

1. **Admit to:**
2. **Diagnosis:** Acetaminophen overdose
3. **Condition:**
4. **Vital signs:** Call MD if
6. **Nursing:** ECG monitoring, inputs and outputs, pulse oximeter, aspiration and seizure precautions.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**
   -Lavage with 2 L of normal saline by nasogastric tube.
   -Activated Charcoal (if recent ingestion) 1 gm/kg PO or NG q2-4h, remove via suction prior to acetylcysteine.
   -N-Acetylcysteine (Mucomyst, NAC)(if indicated) loading dose 140 mg/kg PO or NG in juice, then 70 mg/kg PO or NG q4h x 17 doses (20% sln diluted 1:4 in carbonated beverage); follow acetaminophen levels. Continue for full treatment course even if serum levels fall below nomogram.
   -Phytonadione 5 mg PO/IV/IM/SQ (if PT >1.5 x control).
   -Fresh frozen plasma (if PT >3 x control).
10. **Extras and X-rays:** Portable CXR. Nephrology consult for possible charcoal hemoperfusion.
11. **Labs:** CBC, SMA 7, liver panel, amylase, PT/PTT; SGOT, SGPT, bilirubin acetaminophen level now and q4h until nondetectable. Plot serum acetaminophen level on Rumack-Matthew nomogram to assess severity of ingestion. Do not delay therapy while waiting for serum level results. The nomogram should not be used if sustained release Tylenol was ingested.

# Theophylline Overdose

1. **Admit to:**
2. **Diagnosis:** Theophylline overdose
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** ECG monitoring until level is less than 20 mcg/ml; inputs and outputs, aspiration and seizure precautions.
7. **Diet:**
8. **IV Fluids:** Give IV fluids at rate to treat dehydration.
9. **Special Medications:**
   -Activated Charcoal liquid 1 gm/kg PO or NG q2-4h, followed by cathartic, regardless of time of ingestion.
   -Gastric Lavage if greater than 20 mg/kg ingested or unknown amount ingested or if symptomatic.
   -Charcoal hemoperfusion (if serum level >60 mcg/ml or signs of neurotoxicity, seizure, coma). Ipecac is contraindicated because it may delay use of activated charcoal.
10. **Extras and X-rays:** Portable CXR, ECG.
11. **Labs:** CBC, SMA 7, theophylline level; PT/PTT, liver panel. Monitor K, Mg, phosphorus, calcium, acid/base balance, urine drug screen.

# Iron Overdose

**General Considerations and Treatment:**

Induce emesis with ipecac if recent ingestion (<1 hour ago). Charcoal is not effective and should not be used.

-Gastric Lavage if greater than 20 mg/kg ingested or unknown amount ingested or if symptomatic.

**Labs:** Type and cross, CBC, electrolytes, serum iron, TIBC, PT/PTT, blood sugar, liver function tests, calcium. KUB to determine if tablets are present in intestines (not all tablets are radiopaque).

**Toxicity**:

-Toxicity likely: >60 mg/kg elemental iron.

-Possibly toxic: 20-60 mg/kg elemental iron.

**Management:**

1. If hypotensive, give IV fluids, and place in Trendelenburg's position. If unresponsive to these measures, administer dopamine or norepinephrine by continuous IV infusion.
2. Maintain urine output of >2 ml/kg/h.
3. Monitor electrolytes carefully. Blood products may be needed.
4. If peak serum iron >350 mcg/dL or if patient is symptomatic, begin chelation therapy.
5. Deferoxamine (Desferal) 15 mg/kg/hr continuous IV infusion. Continue until serum iron is within normal range.
6. Consider exchange transfusion in severely symptomatic patients with serum iron >1,000 mcg/dL.

# *Neurology and Endocrinology*

## Seizure and Status Epilepticus

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Seizure
3. **Condition:**
4. **Vital signs:** neurochecks; call MD if:
5. **Activity:**
6. **Nursing:** Seizure and aspiration precautions, ECG and EEG monitoring, pulse oximeter.
7. **Diet:**
8. **IV Fluids:**
9. **Special Medications:**

**Febrile Seizures:** Control fever.

Usually uncomplicated and requires no anticonvulsive therapy. Single febrile seizure pose no risk of epilepsy.

**Indications for lumbar puncture:**

(1) Any suspicion of meningitis
(2) Abnormal neurological exam
(3) Child has been ill for several days
(4) Recovery from febrile seizure is slow.

**Status Epilepticus:**

1. Maintain airway, 100% O2 by mask; obtain brief history, fingerstick glucose, suction prn.
2. Start IV NS. If hypoglycemic, give 1-2 ml/kg D50W IV/IO (0.25-0.5 g/kg) or 2-4 ml/kg of D25W IV/IO.
3. **Lorazepam (Ativan)** 0.1 mg/kg (max 4 mg per dose) IV/IM **OR Diazepam (Valium)** 0.2-0.5 mg/kg slow IV/IO (max 10 mg). Repeat q15-20min x 3 prn; may be given rectally with a small needless syringe 4-5 cm within rectum (use injectable product).
4. Phenytoin 15-18 mg/kg in normal saline at <1 mg/kg/min, max 50 mg/min IV/IO. Monitor BP and ECG (QT interval).
5. If seizures continue, **intubate** and give **Phenobarbital** loading dose of 15-20 mg/kg IV or 5 mg/kg IV every 15 minutes until seizures are controlled or 30 mg/kg is reached.
6. If seizures are refractory to above measures, consider midazolam infusion (0.1 mg/kg/hr) or general anesthesia with EEG monitoring.

**Generalized Seizures Maintenance Therapy:**

-Carbamazepine (Tegretol):

<6 y: initially 5 mg/kg/day PO bid, then may increase in 5-7 day intervals; usual maintenance dose 10-12 mg/kg/day PO bid-qid.

6-12 y: initially 100 mg PO bid or 10 mg/kg/day PO bid, then may increase by 100 mg/day at weekly intervals; usual maintenance dose 15-30 mg/kg/day PO bid-qid.

>12 y: initially 200 mg PO bid, then may increase by 200 mg/day at weekly intervals; usually maintenance dose 800-1200 mg/day PO bid-qid

[tab: 200 mg; tab, chewable: 100 mg; susp: 100 mg/5 ml] **OR**

-Valproic acid (Depakote):

Initially 10-15 mg/kg/day PO bid-tid, then increase by 5-10 mg/kg/day weekly as needed; usual maintenance dose 30-60 mg/kg/day PO bid-tid (children on multiple anticonvulsants may require higher doses [cap: 250 mg; cap, sprinkle: 125 mg; syrup: 250 mg/5 ml; tab, EC: 125,250,500 mg] **OR**

-Phenobarbital: Loading dose 10-20 mg/kg IV/IM/PO, then maintenance dose 3-5 mg/kg/day PO/IV q12-24h [elixir: 4 mg/ml; tab: 8,16,32,65,100 mg] **OR**

-Phenytoin: Loading dose 15-18 mg/kg IV/PO, then maintenance dose 5-7 mg/kg/day PO/IV q8-24h (only sustained release capsules may be dosed q24h) [cap: 30, 100 mg; elixir: 125 mg/5 ml; tab, chewable: 50 mg]

**Partial Seizure, including Secondary Generalized:**

-Carbamazepine (Tegretol), see above **OR**

-Phenytoin, see above

-Phenobarbital, see above **OR**

-Valproic acid, see above.

10. **Extras and X-rays:** MRI with and without gadolinium, EEG with hyperventilation, CXR, ECG. Neurology consultation.
11. **Labs:** ABG/CBG, CBC, SMA 7, calcium, phosphate, magnesium, liver panel, VDRL, anticonvulsant levels, blood and urine culture. UA, drug and toxin screen.

## New Onset Diabetes

1. **Admit to:**
2. **Diagnosis:** New onset Diabetes Mellitus
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Record labs on flow sheet. Fingerstick glucose at 0700, 1200, 1700, 2100, 0200; diabetic and dietetic teaching.
7. **Diet:** American Diabetes Association Diet with 1,000-2,400 calories/day. 3 meals and 3 snacks (between each meal and qhs.)
8. **IV Fluids:** Hep-lock with flush q shift.
9. **Special Medications:**

-Goal is fasting glucose of 70-140 mg/dL and postprandial glucose <180 mg/dL

-Initial insulin dose for child with severe hyperglycemia and ketonuria but without acidosis or dehydration: 0.1-0.25 U regular/kg SC q6-8h. Supplement with regular insulin 0.1 U/kg before each meal if indicated.

-On subsequent days give 2/3 of previous days total insulin requirement as NPH. Divide 2/3 before breakfast and 1/3 before dinner.

-Usual daily maintenance dose for child: 0.5-1.0 U/kg/24h. In adolescents

during growth spurt: 0.8-1.2 U/kg/24h.

10. **Extras and X-rays:** CXR. Endocrine and dietary consult.
11. **Labs:** CBC, ketones; SMA 7 and 12, antithyroglobulin, antithyroid microsomal, anti-insulin, anti-islet cell antibodies. UA, urine culture and sensitivity; urine pregnancy test; urine ketones.

## Diabetic Ketoacidosis

1. **Admit to:** Pediatric intensive care unit.
2. **Diagnosis:** Diabetic ketoacidosis
3. **Condition:** Critical
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** ECG monitoring; capillary glucose checks q1-2h until glucose level is <200 mg/dL, daily weights, inputs and outputs. O2 at 2-4 L/min by NC or mask. Record labs on flow sheet. Urine specific gravity.
7. **Diet:** NPO
8. **IV Fluids:** 0.9% saline 10-20 ml/kg over 1h, then repeat until hemodynamically stable. Then give 0.45% saline, and replace ½ calculated deficit plus insensible loss over 8h, replace remaining ½ of deficit plus insensible losses over 16-24h. Keep urine output >1.0 ml/kg/hour.

   **Add KCL** when no ECG signs of hyperkalemia (peaked T waves) and serum K+ ≤ 5.8 mEq/L.

| **Serum K+** | **Infusate KCL** |
|---|---|
| <3 | 40-60 mEq/L |
| 3-4 | 30 |
| 4-5 | 20 |
| 5-6 | 10 |
| >6 | 0 |

Rate: 0.25-1 mEq KCL/kg/hr, maximum 1 mEq/kg/h or 20 mEq/h (whichever is smaller)

9. **Special Medications:**

-Insulin Regular (Humulin) 0.05-0.1 U/kg/h (50 U in 500 ml NS) continuous IV infusion. Adjust to decrease glucose by 80-100 mg/dL/h.

-If glucose decreases at less than 50 mg/dL/h, increase insulin to 0.14-0.2 U/kg/hr. If glucose decreases faster than 100 mg/dL/h, continue insulin at 0.1 U/kg/h and add D5W to IV fluids. When glucose approaches 250-300 mg/dL, add D5W to IV. Change to subcutaneous insulin when ketones resolved, bicarbonate >15, and patient is tolerating PO food; do not discontinue insulin drip until 2h after subcutaneous dose of insulin.

**Rate for Insulin Drip**

| Blood Glucose Range mg/dL | Insulin Infusion Rate U/kg/hr |
|---|---|
| >275 | 0.1 |
| 250-275 | 0.08 |
| 225-250 | 0.06 |
| 200-225 | 0.05 |
| 175-200 | 0.04 |
| <175 | 0.03 |

10. **Extras and X-rays:** Portable CXR, ECG. Endocrine and dietary consultation.
11. **Labs:** Dextrostixs q1-2h until glucose <200, then q3-6h. Glucose, potassium, phosphate, bicarbonate q3-4h; serum acetone, CBC. UA, urine ketones, culture and sensitivity.

# *Hematology, Nephrology and Inflammatory Disorders*

## Sickle Cell Crisis

1. **Admit to:**
2. **Diagnosis:**
3. **Condition:**
4. **Vital signs:** Call MD if
5. **Activity:**
6. **Nursing:**
7. **Diet:**
8. **IV Fluids:** D5 1/2 NS at 1.5-2.0 x maintenance or 2000 ml/$m^2$ /24h.
9. **Special Medications:**

**Oxygen**

-Oxygen 2-4 L/min by NC or 30-100% by mask.

**Pain Management**

-Morphine sulfate 0.1-0.2 mg/kg/dose (max 10-15 mg) IV/IM/SC q2-4h prn or follow bolus by infusion of 0.05-0.1 mg/kg/h prn or 0.3-0.5 mg/kg PO q4h prn **OR**

-Acetaminophen/codeine 0.5-1 mg/kg/dose (max 60 mg/dose) of codeine IM/SC/PO q4-6h prn [elixir: 12 mg codeine/5 ml] **OR**

-Acetaminophen and hydrocodone [elixir per 5 ml: hydrocodone 2.5 mg, acetaminophen 167 mg; tabs:
Hydrocodone 2.5 mg acetaminophen 500 mg;
Hydrocodone 5 mg acetaminophen 500 mg;
Hydrocodone 7.5 mg acetaminophen 500 mg]
Children: 0.6 mg hydrocodone/kg/day PO q6-8h prn
<2 y: do not exceed 1.25 mg/dose
2-12 y: do not exceed 5 mg/dose
>12 y: do not exceed 10 mg/dose

-**Patient controlled analgesia** may be used if child is old enough to understand the concept.

-Morphine
basal rate 0.01-0.02 mg/kg/hr
intermittent bolus dose 0.01-0.03 mg/kg
bolus frequency ("lockout interval") every 6-15 minutes

-Hydromorphone (Dilaudid)
basal rate 0.0015-0.003 mg/kg/hr
intermittent bolus dose 0.0015-0.0045 mg/kg
bolus frequency ("lockout interval") every 6-15 mins

Note: Meperidine (Demerol) is not recommended due to the risk of seizures.

**Maintenance Therapy**

-Folic acid 1 mg PO qd (if >1 yr).

-Transfusion (if indicated) PRBC 5 ml/kg over 2h, then 10 ml/kg over 2h, then check hemoglobin. If hemoglobin <6-8 gm/dL, give additional 10 ml/kg.

-Penicillin V (prophylaxis), <3 yrs: 125 mg PO bid; >3 yrs: 250 mg PO bid [tabs 125,250,500 mg; elixir 125,250 mg/5 ml]. Amoxicillin may also be

used.
Children <27 kg: 300,000-600,000 u IM
Children >27 kg: 900,000-1,200,000 u IM

10. **Extras and X-rays:** CXR.
11. **Labs:** CBC, blood culture and sensitivity, reticulocyte count, type and cross, parvovirus titers, SMA 7, UA, urine culture and sensitivity, mycoplasma titers.

## Kawasaki's Syndrome (Mucocutaneous Lymph Node Syndrome)

1. **Admit to:**
2. **Diagnosis:**
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:**
7. **Diet:**
8. **Special Medications:**
   -Immunoglobulin (IVIG) 2 gm/kg/dose IV x 1 dose only. Administer dose at 0.02 ml/kg/min over 30 min; if no adverse reaction, increase to 0.04 ml/kg/min over 30 min; if no adverse reaction, increase to 0.08 ml/kg/min for remainder of infusion. Defer measles vaccination for 11 months after receiving high dose IVIG. [inj: 100 mg/ml]
   -Aspirin 100 mg/kg/day PO or PR q6h until fever resolves, then 8-10 mg/kg/day PO/PR qd. [chew tab: 81 mg; tab: 325,500,650 mg; supp: 60,120,125,130,195,200,300,325,600,650 mg]
   -Ambubag, epinephrine (0.1 ml/kg of 1:10,000), and diphenhydramine 1 mg/kg (max 50 mg) should be available for IV use if anaphylactic reaction to immunoglobulin occurs.
9. **Extras and X-rays:** ECG, echocardiogram, chest X-ray. Infectious disease consult.
10. **Labs:** CBC with differential and platelet count. ESR, CBC, liver function tests, rheumatoid factor, salicylate levels (while on high dose therapy), blood culture and sensitivity x 2, SMA 7.

# *Fluids and Electrolytes*

## Dehydration

1. **Admit to:**
2. **Diagnosis:** Dehydration
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights. Urine specific gravity q void.
7. **Diet:**
8. **IV Fluids:**

**Maintenance Fluids:**

| | |
|---|---|
| <10 kg | 100 ml/kg/24h |
| 10-20 kg | 1000 ml plus 50 ml/kg/24h for each kg >10 kg |
| >20 kg | 1500 ml plus 20 ml/kg/24h for each kg >20 kg. |

**Electrolyte Requirements:**

Sodium 3-5 mEq/kg/day
Potassium 2-3 mEq/kg/day
Chloride 3 mEq/kg/day
Glucose 5-10 gm/100 ml water required

**Clinical Signs of Fluid Deficit Status:**

| | |
|---|---|
| Mild 5-7%. Fluid deficit <50 ml/kg | Increased pulse (10% >baseline), normal blood pressure, slightly dry mucous membranes; increased thirst, decreased tears, fontanelle flat, skin turgor; decreased urine output, increased urine specific gravity. |
| Moderate 5-10%. Fluid deficit 50-100 ml/kg. | Increased severity of above plus decreased skin turgor, oliguria, irritability, dry mucous membranes, increased thirst, postural hypotension, elevated pulse, sunken fontanelle, absent tears, sunken eyes, increased BUN. |
| Severe >10%. Fluid deficit ≥100 ml/kg | Hypotension, tachycardia, parched mucous membranes, very sunken eyes, delayed capillary refill (>3 sec), acidosis, decreased bicarbonate, hyperirritability, lethargy, skin tenting, anuria. |

**Electrolyte Deficit Calculation:**

$Na^+$ deficit=(desired Na-measured Na in mEq/L) x 0.6 x weight in kg
$K^+$ deficit=(desired K-measured K in mEq/L) x 0.25 x weight in kg
$Cl^-$ deficit=(desired Cl-measured Cl in mEq/L) x 0.45 x weight in kg
Free H2O deficit in hypernatremic Dehydration = 4 ml/kg for every mEq that serum Na >145 mEq/L.

**Phase 1 Acute Fluid Resuscitation (Symptomatic Dehydration):**

-Give D5NS or NS at 20-30 ml/kg IV over 60 min; may repeat fluid boluses of NS, 20-30 ml/kg, until adequate circulation (use dextrose-free solution in repeat boluses unless glucose <60 mg/dL). If in shock, give at max rate until stable.

**Phase 2 Deficit and Maintenance Therapy (Asymptomatic dehydration):**

**Hypotonic Dehydration (Na+ <125 mEq/L):**

-Calculate total maintenance and deficit fluids and sodium deficit for 24h (minus fluids and electrolytes given in Phase 1). If isotonic or hypo natremic dehydration, replace 50% over 8h, 50% over next 16h.

-Estimate and replace ongoing losses q6-8h.

-Add potassium to IV solution after first void.

-Usually D5 0.45% or 0.9% saline with 10-40 mEq KCL/liter at 60 ml/kg over 2 hours. Then infuse at 6-8 ml/kg/h for 12h.

-See "hyponatremia," page 126.

**Isotonic Dehydration (Na+ 130-150 mEq/L):**

-Calculate total maintenance and replacement and electrolytes fluids for 24h (minus fluids and electrolytes given in Phase 1) and give half over first 8h, then remaining half over next 16 hours.

-Add potassium to IV solution after void.

-Estimate and replace ongoing losses.

-Usually D5 1/2 NS or D5 1/4 NS with 10-40 mEq KCL/L.

**Hypertonic Dehydration (Na+ >150 mEq/L):**

-Calculate and correct free water deficit and correct slowly. Lower sodium by 10 mEq/L/day; avoid causing a decline in sodium of more than 15 mEq/L/24h or by >0.5 mEq/L/hr.

-If volume depleted, give NS 20-40 ml/kg IV until adequate circulation, then give 1/2-1/4 NS in 2.5-5% dextrose to replace half of free water deficit over first 24h. Follow serial serum sodium levels and correct deficit over 48-72h.

-**Free water deficit:** 4 ml/kg x (Serum Na+ -145)

-Also see "hypernatremia" page 126.

-If indicated, add potassium to IV solution after void as KCL.

-Usually D51/4NS or D5W with 10-40 mEq/L KCL. Estimate and replace ongoing losses and maintenance.

**Replacement of ongoing losses (usual fluids):**

-Nasogastric suction: D5 1/2NS with 20 mEq KCL/L or 1/2 NS + KCL 20 mEq/L.

-Diarrhea: D5 1/4 NS with 40 mEq KCL/L

**Oral Rehydration Therapy (mild-moderate dehydration < 10%):**

-Oral rehydration electrolyte solution (Rehydralyte, Pedialyte, Ricelyte, Revital Ice) deficit replacement of 60-80 ml/kg PO or via NG tube over 2h. Provide additional fluid requirement over remaining 18-20 hours; add anticipated fluid losses from stools of 10 ml/kg for each diarrheal stool.

**Oral Electrolyte Mixtures:**

| | Electrolyte Content | | | |
|---|---|---|---|---|
| **Product** | **Na (mEq/L)** | **K (mEq/L)** | **Cl (mEq/L)** | **Available** |
| Rehydralyte | 75 | 20 | 65 | 240 ml bottle |
| Ricelyte | 50 | 25 | 45 | 1000 ml bottle |
| Pedialyte | 45 | 20 | 35 | 240, 960 ml bottle |

**9. Labs:** SMA7, BUN, creatinine, glucose, urine electrolytes, UA.

## Hypernatremia

1. **Admit to:**
2. **Diagnosis:** Hypernatremia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights.
7. **Diet:**
8. **IV Fluids:**
   If volume depleted or in shock, give NS 20-40 ml/kg IV until adequate circulation, then give D5 1/2 NS IV to replace half of body water deficit over first 24h. Correct serum sodium slowly at 0.5-1 mEq/L/h. Correct remaining deficit over next 48-72h.
   Body water deficit (L) = 0.6(weight kg)(Na serum-140)

**Hypernatremia with ECF Volume Excess**:
-Furosemide (Lasix) 1 mg/kg IV.
-D5W or other hypotonic fluid to correct body water deficit.

9. **Extras and X-rays:** ECG.
10. **Labs:** SMA 7, osmolality, triglycerides. UA, urine specific gravity; 24h urine Na, K, creatinine.

## Hyponatremia

1. **Admit to:**
2. **Diagnosis:** Hyponatremia
3. **Condition:**
4. **Vital signs:** Call MD if:
5. **Activity:**
6. **Nursing:** Inputs and outputs, daily weights.
7. **Diet:**
8. **IV Fluids:**

**Hyponatremia with increased ECF and edema (Hypervolemia)**(low osmolality <280, urine sodium <10 mMol/L: nephrosis, CHF, cirrhosis; urine sodium >20: acute/chronic renal failure):
-Water restrict 1/2 maintenance. No added salt diet.
-Furosemide (Lasix) 1 mg/kg/dose IV over 1-2min or 2-3 mg/kg/day PO q8-24h.

**Hyponatremia with Isovolemia** (low osmolality <280, URINE SODIUM <10 mMol: water intoxication; URINE SODIUM >20: SIADH, hypothyroidism, renal failure, Addison's disease, stress, drugs):
-0.9% saline with 20-40 mEq KCL/L infused to correct at rate of <0.5 mEq/L/h) **OR** use 3% NS in severe hyponatremia [3% NS = 513 mEq/liter].
-Water restrict to 1/2 maintenance.

**Hyponatremia with Hypovolemia** (low osmolality <280) URINE SODIUM <10 mMol/L: vomiting, diarrhea, 3rd space/respiratory/skin loss; URINE SODIUM >20 mMol/L: diuretics, renal injury, renal tubular acidosis, adrenal insufficiency, partial obstruction, salt wasting:

-If volume depleted, give NS 20-40 ml/kg IV until adequate circulation.

-Gradually correct sodium deficit in increments of 10 mEq/L. Determine volume deficit clinically and determine sodium deficit as below.

-Calculate 24 hour fluid and sodium requirement and give half over first 8h, then remainder over 16 hours. 0.9% saline = 154 mEq/L

-Usually D5NS 60 ml/kg IV over 2h (this will increase extracellular Na by 10 mEq/L), then infuse at 6-8 ml/kg/hr x 12h.

**Severe Symptomatic Hyponatremia**:

-If volume depleted, give NS 20-40 ml/kg until adequate circulation.

-Determine vol of 3% hypertonic saline (513 mEq/L) to be infused as follows:

Na(mEq) deficit = 0.6 x (wt kg) x (desired Na - actual Na)

Volume of sln (L) = Sodium to be infused (mEq) ÷ mEq/L in solution

-Correct half of sodium deficit slowly over 24h.

-For acute correction, the serum sodium goal is 125 mEq/L; max rate for acute replacement 1 mEq/kg/hr. Serum Na should be adjusted in increments of 5 mEq/L to reach 125 mEq/L. First dose usually given over 4 hrs. For further correction for serum sodium to above 125 mEq/L, calculate mEq dose of sodium and administer over 24-48h. Changes in sodium of greater than 10 mEq/L/day are not recommended

9. **Extras and X-rays:** CXR, ECG.
10. **Labs:** SMA 7, osmolality, triglyceride. UA, urine specific gravity. Urine osmolality, Na, K; 24h urine Na, K, creatinine.

# *Newborn Care*

## Neonatal Resuscitation

**APGAR Score**

| Sign | 0 | 1 | 2 |
|---|---|---|---|
| Heart rate per minute | Absent | Slow (<100) | >100 |
| Respirations | Absent | Slow, irregular | Good, crying |
| Muscle tone | Limp | Some flexion | Active motion |
| Reflex irritability (catheter in nares) | No response | Grimace | Cough or sneeze |
| Color | Blue or pale | Pink body with blue extremities | Completely pink |

Assess APGAR score at 1 minute and 5 minutes, then continue assessment at 5 minute intervals until APGAR >7.

**General Measures:**

1. Review history, check equipment, oxygen, masks, laryngoscope, ET tubes, medications.

**Vigorous, Crying Infant:**

1. Routine delivery room care; heart rate > 100 beats per minute, spontaneous respirations, good color and tone.
2. Aspirate mouth then nose gently using bulb syringe; dry skin and maintain neutral thermal environment.

**Moderate Depression:**

1. If respiratory efforts are present but skin is pale or cyanotic, provide 100% oxygen by mask or blowby.
   If **Meconium** is 2+ or more, or if in respiratory distress, intubate immediately and suction trachea until clear (do not positive pressure ventilate until trachea has been suctioned).
2. If no improvement or if clinical condition deteriorates, bag and mask ventilate with intermittent positive pressure using 100% $Fi0_2$; stimulate vigorously by drying. Initial breath pressure: 30-40 cm $H_2O$ for term infants, 20-30 cm $H_2O$ for pre-term infants. Then ventilate at 15-20 cm $H_20$ at 30-40/breaths per minute. Monitor bilateral breaths sounds and expansion.
3. If spontaneous respirations develop and heart rate is normal, gradually reduce ventilation rate until only using continuous positive airway pressure (CPAP).

Wean to blowby oxygen, but continue blowby oxygen if baby remains dusky.

4. Consider intubation if heart rate remains <100 beats per minute and is not rising, or if respirations are poor and weak, or for airway control.

**Severe Depression:**

1. Bag and mask ventilate with intermittent positive pressure using 100% $FiO_2$.
2. If heart rate does not increase to >60 beats per minute after 30 seconds of ventilation, initiate external cardiac compressions at 120 beats per min. May discontinue cardiac compressions when heart rate is >80 beats per minute and rising. If condition improves, change to CPAP by mask using 100% $FiO_2$, then change to blowby oxygen as tolerated.
3. If condition worsens or if there is no change after 30 seconds, or if mask ventilation is difficult: use laryngoscope to suction oropharynx and trachea, and intubate. Apply positive pressure ventilation. Check bilateral breath sounds and chest expansion. Check and adjust ET tube position if necessary. Continue cardiac compressions if heart rate remains depressed. Check CXR for tube placement.

**Hypotension or Bradycardia:**

1. Epinephrine 0.1-0.3 ml/kg = 0.01-0.03 mg/kg (0.1 mg/ml = 1:10,000) IV or ET q3-5min. Dilute ET dose to 2-3 ml in NS. If infant fails to respond, consider increasing dose to 0.1 mg/kg. (0.1 ml/kg of 1 mg/ml = 1:1000)

**Hypovolemia:** Insert umbilical vein catheter and give O negative blood, plasma, 5% albumin or normal saline, 10 ml/kg IV over 5-10 minutes. May repeat as necessary to correct hypovolemia.

**Severe Birth Asphyxia, Mixed Respiratory/Metabolic Acidosis (not responding to ventilatory support; pH <7.2):**

1. Sodium Bicarbonate, 1 mEq/kg, dilute 1:1 in sterile water IV q5-10min as indicated. Bicarbonate may be given for documented as well as suspected acidosis.

**Narcotic-Related Depression:**

1. Naloxone (Narcan) 0.1 mg/kg = 0.25 ml/kg (0.4 mg/ml concentration) or 0.1 ml/kg (1 mg/ml concentration) ET/IV/IM/SC, may repeat q2-3 min. Caution: If maternal drug abuser, may cause withdrawal and seizures in infant.
2. Repeat administration may be necessary since the duration of action of naloxone may be shorter than the duration of action of the narcotic.

**Intubation:**

Premature infant <1.25 kg (2 lbs) 2.5 mm tube; size 0 blade; 7.5 cm tip to lip.
Premature 1.25-2 kg (2-5 lbs) 3 mm tube; 0 blade; 8 cm tip to lip.
Full term > 2 kg (5 lb) 3.5 mm tube; 1 blade; 8.5 cm tip to lip.

# Neonatal Suspected Sepsis

**Term Newborn Infants <1 month old (group B strep, E coli, or group D strep, gram negatives, Listeria monocytogenes:**

Ampicillin and gentamicin **OR** ampicillin and cefotaxime
Add vancomycin if >7 days old and has central line.

**Neonatal Dosage of Ampicillin:** (IV, IM)

<1200 gm 0-4 weeks
100 mg/kg/day q12h
1200-2000 gm
<7d: 100 mg/kg/day q12h
>7d: 150 mg/kg/day q8h
>2000 gm
<7d: 150 mg/kg/day q8h
>7d: 200 mg/kg/day q6h

**Cefotaxime (Claforan):** (IV/IM)

<1200 grams: 0-4 wks: 100 mg/kg/day q12h
> 1200 grams: 0-7 days: 100 mg/kg/day q12h
>7 days: 150 mg/kg/day divided q8h

**Gentamicin/Tobramycin:** 2.5 mg/kg/dose IV/IM

Dosing Interval:
Gestational Age <28 wks and < 7 days old: q24h; >7 days: q18h
28-34 wks and <7 days old: q18h; >7 days: q12h
>34 wks and < 30 days: q12 h

**Neonatal Vancomycin Dosage Guidelines:** (IV)

| | |
|---|---|
| Wt< 1.5 kg and age <7 days: | 15 mg/k/day q24h |
| Wt< 1.5 kg and age 7-30 days: | 20 mg/k/day q12h |
| Wt< 1.5 kg and age >30 days: | 30 mg/kg/day q8h |
| Wt 1.5-2 kg and age <7 days: | 20 mg/k/day q12h |
| Wt 1.5-2 kg and age 7-30 days: | 20 mg/k/day q12h |
| Wt 1.5-2 kg and age >30 days: | 30 mg/kg/day q8h |
| Wt >2 kg and age <7 days: | 20 mg/k/day q12h |
| Wt >2 kg and age 7-30 days: | 30 mg/kg/day q8h |
| Wt >2 kg and age >30 days: | 40 mg/k/day q6h |

Note: If serum creatinine is >1.2 mg/dL, use an initial dosage of 15 mg/kg/day q24h and determine serum vancomycin concentrations within 24-48 hours.

**Nafcillin:** (IV, IM)

<1200 gm
0-4 weeks 50 mg/kg/day q12h
1200-2000 gm
<7 days: 50 mg/kg/day q12h
>7 days: 75 mg/kg/day q8h
>2000 gm
<7 days: 75 mg/kg/day q8h
>7 days: 100 mg/kg/day q6h

**Mezlocillin:** (IV, IM)

<1200 gm
0-4 weeks 150 mg/kg/day q12h
1200-2000 gm
<7 days: 150 mg/kg/day q12h

# GYNECOLOGY AND OBSTETRICS

# *Surgical Documentation for Gynecology*

## Gynecologic Surgical History

**Identifying Data:** Patient's name, age, race, sex; referring physician; hospital identification number.
**Chief Compliant:** Reason given by patient for seeking surgical care; place patient's complaint in "quotation marks."
**History of Present Illness (HPI):** Describe the course of the patient's illness, including when it began, character of the symptoms; pain onset (gradual or rapid), precise character of pain (constant, intermittent, cramping, stabbing, radiating); other factors associated with pain (defecation, urination, eating, strenuous activities); location where the symptoms began; aggravating or relieving factors. Vomiting (color, content, blood, coffee-ground emesis, frequency, associated pain). Change in bowel habits; bleeding, character of blood (clots, bright or dark red), trauma; recent weight loss or anorexia; other related diseases; past diagnostic testing.
**Past Medical History (PMH):** Past medical problems. Previous operations and indications; dates and types of procedures; serious injuries, hospitalizations; diabetes, hypertension, peptic ulcer disease, asthma, heart disease; hernia, gallstones.
**Medications:** Aspirin, anticoagulants, hypertensive and cardiac medications, diuretics, anticonvulsants.
**Allergies:** Penicillin, codeine, iodine, others.
**Family History:** Medical problems in relatives. Family history of colonic polyposis, carcinomas.
**Social History:** Alcohol, smoking, drug usage, occupation.
**Review of Systems (ROS):**
**General:** Weight gain or loss; loss of appetite, fever, fatigue, night sweats. Activity level.
**HEENT:** Headaches, seizures, sore throat, masses, dentures.
**Respiratory:** Cough, sputum, hemoptysis, dyspnea on exertion, ability to walk up flight of stairs.
**Cardiovascular:** Chest pain, orthopnea, claudication, extremity edema.
**Gastrointestinal:** Dysphagia, vomiting, abdominal pain, hematemesis, melena (black tarry stools), hematochezia (bright red blood per rectum), constipation, change in bowel habits; hernia, hemorrhoids, gallstones.
**Genitourinary:** Dysuria, hesitancy, hematuria, discharge; impotence, prostate problems.
**Gynecological:** Last menstrual period, gravida, para, abortions, length of regular cycle birth control.
**Skin:** Easy bruising, bleeding tendencies.
**Neurological:** Stroke, transient ischemic attacks, weakness.

## Gynecologic Surgical Physical Examination

**Vital Signs:** Temperature, respirations, heart rate, blood pressure, weight.
**Eyes:** Pupils equally round and react to light and accommodation (PERRLA); extraocular movements intact (EOMI).
**Neck:** Jugular venous distention (JVD), thyromegaly, masses, bruits; lymphadenopathy; trachea midline.
**Chest:** Equal expansion, dullness to percussion; rales, rhonchi, breath sounds.
**Heart:** Regular rate and rhythm (RRR), first and second heart sounds; murmurs (grade 1-6), pulses (graded 0-2+).
**Breast:** Skin retractions, tenderness, masses (mobile, fixed) nipple discharge, erythema, axillary or supraclavicular node enlargement.
**Abdomen:** Contour (flat, scaphoid, obese, distended); scars, bowel sounds, bruits, tenderness, masses, liver span; splenomegaly, guarding, rebound, percussion note (tympanic), pulsatile masses, costovertebral angle tenderness (CVAT), abdominal hernias.
**Genitourinary:** Inguinal hernias, testicles, varicoceles; urethral discharge.
**Extremities:** Edema (grade 1-4+); cyanosis, clubbing, edema, pulses (radial, ulnar, femoral, popliteal, posterior tibial, dorsalis pedis; simultaneous palpation of radial and femoral pulses). Grading of pulses: 0 = absent; 1+ weak; 2+ normal; 3+ very strong.
**Rectal Exam:** Masses, tenderness hemorrhoids, guaiac test for occult blood; prostate masses; bimanual palpation.
**Neurological:** Mental status; gait, strength (graded 0-5); tendon reflexes, sensory testing.
**Laboratory Evaluation:** Electrolytes (sodium, potassium, bicarbonate, chloride, BUN, creatinine), blood glucose, liver function tests, PT/PTT, CBC with differential; X-rays, ECG (if older than 35 yrs or cardiovascular disease), urine analysis.
**Assessment (Impression):** Assign a number to each problem and discuss each problem separately. Begin with most important problem and rank in order.
**Plan:** Describe surgical plans for each numbered problem, including preoperative testing, laboratory studies, medications, antibiotics, preoperative endoscopy.

## Preoperative Note

**Preoperative Diagnosis:**
**Procedure Planned:**
**Type of Anesthesia Planned:**
**Laboratory Data:** Electrolytes, BUN, creatinine, CBC, PT/PTT, UA, EKG, Chest X-ray; type and screen for blood or cross match if indicated; liver function tests, ABG.
**Risk Factors:** Cardiovascular, pulmonary, hepatic, renal, coagulopathic, nutritional risk factors.
**Consent:** Document explanation to patient of risk and benefits of procedure, and document patient's or guardian's informed consent and understanding of the procedure. Obtain signed consent form.
**Allergies:**
**Major Medical Problems:**
**Medications:**
**Special Requirements:** Signed blood transfusion consent form; documentation that patient with breast procedure has been given information brochure.

# Brief Operative Note

This note should be written in chart immediately after the surgical procedure.
**Date of the Procedure:**
**Preoperative Diagnosis:**
**Postoperative Diagnosis:**
**Procedure:**
**Operative Findings:**
**Names of Surgeon and Assistant:**
**Anesthesia:** General endotracheal, spinal, epidural, regional or local.
**Estimated Blood Loss (EBL):**
**Fluids and Blood Products Administered During Procedure:**
**Urine output:**
**Specimens:** Pathology specimens, cultures, blood samples.
**Intraoperative X-rays:**
**Drains:**

# Operative Report

This report should be dictated at the conclusion of surgical procedure.
**Identifying Data:** Name of patient, medical record number; name of dictating physician, date of dictation.
**Attending Surgeon and Service:**
**Date of Procedure:**
**Preoperative Diagnosis:**
**Postoperative Diagnosis:**
**Procedure Performed:**
**Names of Surgeon and Assistants:**
**Type of Anesthesia Used:**
**Estimated Blood Loss (EBL):**
**Fluid and Blood Products Administered During Operation:**
**Specimens:** Pathology, cultures, blood samples.
**Drains and Tubes Placed:**
**Complications:**
**Consultations Intraoperatively:**
**Indications for Surgery:** Brief history of patient and indications for surgery.
**Findings:**
**Description of Operation:** Position of patient; skin prep and draping; location and types of incisions; details of procedure from beginning to end including description of findings, both normal and abnormal, during surgery. Intraoperative studies or x-rays; hemostatic and closure techniques; dressings applied. Patient's condition and disposition. Needle and sponge counts as reported by operative nurse. Send copies of report to surgeons and referring physicians.

# Post-Operative Orders

1. **Transfer:** From recovery room to surgical ward when stable.
2. **Vital Signs:** q4h, I&O q4h x 24h.
3. **Activity:** Bed rest; ambulate in 6-8 hours if appropriate. Incentive spirometer q1h while awake.
4. **Diet:** NPO x 8h, then sips of water. Advance from clear liquids to regular diet as tolerated.
5. **IV Fluids:** IV D5 LR or D5 1/2 NS at 125 cc/h (KCL, 20 mEq/L if indicated) Foley to gravity.
6. **Medications:**
   Cefazolin (Ancef) 1 gm IVPB q8h x 3 doses; if indicated for prophylaxis in clean cases **OR**
   Cefotetan 1 gm IV q12h x 2 doses for clean contaminated cases.
   Meperidine (Demerol) 50-75 mg IM q3-4h prn pain
   Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn pain **OR**
   Prochlorperazine (Compazine) 10 mg IM q4-6h prn nausea or suppository q 4h prn.
7. **Laboratory Evaluation:** CBC, SMA7, chest x-ray in AM if indicated.

# Problem-Oriented Surgical Progress Note

**Problem List:** Post-operative day number, antibiotic day number, hyperalimentation day number if applicable. List each surgical problem separately (e.g. status-post appendectomy, hypokalemia).
**Subjective:** Describe how the patient feels in the patient's own words; and give observations about the patient.
**Objective:** Vital signs; physical exam for each system; thorough examination and description of wound. Condition of dressings; purulent drainage, granulation tissue, erythema; condition of sutures, dehiscence. Amount and color of drainage, laboratory data.
**Assessment:** Evaluate each numbered problem separately.
**Plan:** For each numbered problem, discuss any additional orders or surgical plans. Discuss changes in drug regimen or plans for discharge or transfer. Acknowledge conclusions of consultants.

# Discharge Summary

**Patient's Name:**
**Chart Number:**
**Date of Admission:**
**Date of Discharge:**
**Admitting Diagnosis:**
**Discharge Diagnosis:**
**Name of Attending or Ward Service:**
**Surgical Procedures, Diagnostic Tests, Invasive Procedures:**
**Brief History and Pertinent Physical Examination and Laboratory Data:** Describe the course of the disease up to the time the patient came to the hospital, and describe the physical exam and laboratory data on admission.

**Hospital Course:** Describe the course of the patient's illness while in the hospital, including evaluation, treatment, outcome of treatment, and medications given while in the hospital.

**Discharged Condition:** Describe improvement or deterioration in condition.

**Disposition:** Describe the situation to which the patient will be discharged (home, nursing home), and person who will provide care.

**Discharged Medications:** List medications and instructions (and write prescriptions).

**Discharged Instructions and Follow-up Care:** Date of return for follow-up care at clinic; diet, exercise instructions.

**Problem List:** List all active and past problems.

**Copies:** Send copies to attending physician, clinic, consultants and referring physician.

# General Gynecology

## Management of the Abnormal Pap Smear

**I. Screening for Cervical Cancer**

**A.** All women age who are 18 or older, or who have been sexually active, should have an annual cervical smear and pelvic examination. After 3 or more consecutive normal annual examinations, the smear may be performed less frequently (every 2-3 years) if there are no risk factors for cervical cancer.

**B. Risk Factors for Invasive Squamous Cell Cancer**

Smoking
Previous abnormal cervical smear or biopsy
Abnormal cervical findings on visual or bimanual examination
Young age
History of sexually transmitted disease (human papillomavirus infection)
Early initiation of sexual intercourse (before age 20)
History of more than two sexual partners
Lower socioeconomic status

**II. Technique of Cytologic Sampling**

**A.** Sampling error is a major cause of false-negative smears. The scraping of the portio should include the entire transformation zone, and an endocervical sample should be obtained with an endocervical brush. The entire portio should be visible when the smear is obtained.

**B.** The sample should be collected prior to the bimanual examination to avoid contamination with lubricant.

**C.** When large amounts of vaginal discharge are present, the discharge should be removed before obtaining the smear.

**D.** Large amounts, as occurs during menses, will interfere with cytologic sampling. Vaginitis should be treated and cured before sampling.

**E.** The portio sample should be obtained before the endocervical sample because bleeding from the endocervix may occur after brush use. When obtaining the endocervical sample, gently rotate brush in the endocervical canal. The endocervical and ectocervical samples are placed on a single slide.

**F.** Uniformly apply the sample to the slide, without clumping, and rapidly fix. Hold spray at least 10 inches away to prevent destruction of cells.

**Bethesda System of Cytologic Diagnoses**

**I. Descriptive Diagnoses**

**A. Benign Cellular Changes:**

**1. Infection:**

Trichomonas vaginalis
Fungal organisms consistent with *Candida* spp
Predominance of coccobacilli consistent with shift in vaginal flora
Bacteria morphologically consistent with Actinomyces spp
Cellular changes associated with herpes simplex virus

**2. Reactive Cellular Changes Associated with:**

Inflammation
Atrophy with inflammation ("atrophic vaginitis")
Intrauterine contraceptive device (IUD)

**B. Epithelial Cell Abnormalities:**

**1. Atypical Squamous Cells of Undetermined Significance (ASCUS):** Qualify (reactive or premalignant)

**2. Low-grade Squamous Intraepithelial Lesion Encompassing:**

HPV
Mild dysplasia/CIN 1

**3. High-grade Squamous Intraepithelial Lesion Encompassing:**

Moderate and severe dysplasia
CIS/CIN 2 and CIN 3

**4. Squamous Cell Carcinoma**

**C. Glandular Cell Abnormalities:**

Endometrial cells, cytologically benign, in a postmenopausal woman
Atypical glandular cells of undetermined significance: Qualify (reactive or premalignant)
Endocervical adenocarcinoma
Endometrial adenocarcinoma
Extrauterine adenocarcinoma
Adenocarcinoma, not otherwise specified

**III. Management of Abnormal Pap Smear Results**

**A. Satisfactory, but Limited by Few (or absent) Endocervical Cells**

1. Endocervical cells are absent in up to 10% of Pap smears pre-menopause; up to 50% postmenopausally.
2. **Management:** Either repeat annually or only recall women with previously abnormal Pap smears.

**B. Unsatisfactory for Evaluation**

1. Repeat Pap smear midcycle in 6-12 weeks.
2. If atrophic smear, treat with estrogen for 6-8 weeks, then repeat Pap smear.

**C. Benign Cellular Changes**

1. **Infection-Candida**
   - **a.** Most cases represent asymptomatic colonization.
   - **b.** Treatment should be offered for symptomatic cases.
   - **c.** Repeat Pap at usual interval.
2. **Infection-Trichomonas**
   - **a.** If not recently treated, offer treatment because it may transmit sexually.
   - **b.** Repeat Pap at usual interval.
3. **Infection-Predominance of Coccobacilli consistent with Shift in Vaginal Flora**
   - **a.** Implies possible bacterial vaginosis, but is non-specific.
   - **b.** Diagnosis should be confirmed by findings of a homogeneous vaginal discharge, positive amine test, and clue cells on microscopic saline suspension.
4. **Infection-Actinomyces**
   - **a.** Seen more frequently in IUD users; usually due to colonization, not infection.
   - **b.** Examine patient to exclude pelvic actinomycosis (adnexal pain and cervical discharge). Repeat Pap smear 1-2 months after first smear. If still positive, then remove IUD and recheck Pap smear in 1-2 months. If still positive, then treat with penicillin for at least 30 days.
5. **Infection-Herpes Simplex Virus**
   - **a.** Pap smear has poor sensitivity but good specificity for HSV; a positive smear usually is caused by asymptomatic infection.
   - **b.** Inform patient of pregnancy risks and possibility of transmission.
   - **c.** No treatment is necessary. Repeat Pap as for a benign result.
6. **Reactive Non-Specific Inflammation**
   - **a.** May be caused by metaplasia, chlamydial or gonococcal endocervicitis, or viral infection.
   - **b.** Examine patient, culture for gonorrhea, and test for chlamydia. Treat empirically if mucopurulent cervicitis is seen or treat if results are positive.
   - **c.** Repeat Pap smear in 6-8 weeks if treated; repeat at usual interval if not treated.
7. **Atrophy with Inflammation**
   - **a.** Common in post-menopausal women or those with estrogen-deficiency states.
   - **b.** May be treated with vaginal estrogen for 4-6 weeks, then repeat smear.

**D. Squamous Cell Abnormalities**

1. **Atypical Squamous Cells of Undetermined Significance (ASCUS)**
   - **a.** Indicates cells with nuclear atypia, but not due to HPV.
   - **b.** The most common strategy is to repeat Pap smear at intervals of 3-6 months. If two consecutive smears are negative, then repeat yearly Pap smears. If repeat Pap smear shows ASCUS or more advanced stage changes, then colposcopy and biopsy are indicated. Many clinicians manage ASCUS by colposcopy and biopsy initially.
2. **Low Grade Squamous Intraepithelial Lesion (LG-SIL):** LG-SIL includes human papilloma virus, koilocytosis, atypia, mild dysplasia/CIN I. 60% of LG-SIL lesions regress spontaneously; 15%

progress to HG-SIL.

a. **Management options for LG-SIL**
   (1) **Colposcope with a single LG-SIL result:** If the Biopsy is normal, the patient should be reevaluated with Pap smear every 4-6 months for 2 years.
   (2) **Follow with Pap smears every 4-6 month for 2 years; if any two Paps show LG-SIL or ASCUS, refer for colposcopy**.

3. **High-Grade Squamous Intraepithelial Lesion (HG-SIL; moderate/severe dysplasia; CIN 2, CIN 3, carcinoma in situ):** Must be evaluated by colposcopy and directed biopsy.

**E. Glandular Cell Abnormalities**

1. **Endometrial Cells**
   **a.** A normal finding in premenopausal woman with normal menstrual pattern.
   **b.** Woman with abnormal bleeding or women who are postmenopausal must be evaluated with endometrial sampling.
2. **Atypical Glandular Cells of Undetermined Significance (AGCUS)**
   **a.** Could represent infection, HPV infection, adenocarcinoma in situ, or adenocarcinoma. The most common strategy is to repeat Pap smear at interval of 3-6 months.
   **b.** AGCUS/premalignant changes must be evaluated by endocervical curettage with colposcopic evaluation.
   **c.** If preinvasive or invasive adenocarcinoma is suspected from these studies, diagnostic conization is indicated.
3. **Endocervical Adenocarcinoma, Endometrial Adenocarcinoma, Extrauterine Adenocarcinoma, Adenocarcinoma, not otherwise specified:** These diagnoses require thorough evaluation that may include endocervical curettage, cone biopsy, and/or endometrial biopsy.

## IV. Technique of Colposcopically Directed Biopsy

**A.** Liberally apply a solution of acetic acid 3-5% to cervix, and inspect cervix for abnormal areas (white epithelium, punctation, mosaic cells, atypical vessels). Obtain biopsies of any abnormal areas under colposcopic visualization. Record location of each biopsy.

**B.** Hemostatic agents such as Monsel solution may be applied to stop bleeding.

**C. Endocervical Curettage:** ECC is usually done routinely during colposcopy, except during pregnancy.

## V. Treatment Based on Biopsy Findings

**A. Benign Cellular Changes (infection, reactive inflammation):** Treat infection. Repeat smear every 4-6 months; after 2 negatives, repeat yearly.

**B. Treatment of Squamous Intraepithelial Lesions**

1. **Typical (papillary) Condyloma Acuminata:** Use either cryotherapy, LEEP, or laser.
2. **Low Grade SIL (flat condyloma or CIN I)**
   **a. Aggressive Approach:** If the entire lesion is visualized and the limits of the transformation zone are seen, the lesion can be ablated. Since 15% of these lesions progress to high grade squamous intraepithelial lesion, ablation or excision is a reasonable treatment.

**b. Conservative Approach:** Since the risk of progression is at most 20% and the lesion is not dangerous until it progresses, these lesions may be followed with repeat Pap smear in 4-6 months until there is evidence of progression to HG-SIL or persistence of low grade SIL. If the untreated lesion does not resolve after a year, reevaluation by colposcopy, biopsy, and ablation are indicated.

**3. High Grade SIL (or treated LG-SIL)**

**a.** Ablative therapy is completed to destroy the entire transformation zone.

**b.** Ablation is appropriate if the entire lesion and transformation zone are seen and endocervical curettage is negative. After the lesion has been removed, Pap smears should be scheduled at 3-month intervals for 1 year.

**C. Cryotherapy Double Freeze Technique:**

**1.** Freeze with lubricated, liquid nitrogen probe for 3 minutes, followed by 4-5 minute pause, repeat freeze for 3 min (or use LEEP, Cautery, laser).

**2.** The entire lesion should be covered, and a 3 mm margin of freeze should be visualized. Then repeat Pap smear every 4-6 months for 1-2 years.

# Hormonal Contraception

**I. Oral Contraceptives**

**A.** Oral contraceptives are considered moderate dose if they contain 50 mcg of estrogen, and low dose if they contain less than 50 mcg.

**B.** Five progestins (norethindrone, levonorgestrel, norgestrel, norethindrone acetate, or ethynodiol diacetate) are available. Two new, less androgenic progestins are norgestimate and desogestrel.

**C.** All OCs are consistently effective. Almost all OCs contain the same estrogen--ethinyl estradiol--but this may be combined with any of the seven progestins. The newer progestins are thought to have reduced androgenic effects. Lower androgenicity may decrease the incidence of acne, hirsutism, and weight gain.

**D.** Monophasic OCs have a constant dose of estrogen and progestin in each of the 21 tablets of active hormones in each cycle pack. Phasic OCs alter the dose of the progestin and (in some formulations) the estrogen component among the 21 active tablets in each pack with the aim of reducing metabolic effects while maintaining efficacy and cycle control.

**E.** Progestin-only oral contraceptives (mini-pills) are formulated with doses of progestins even lower than those in low-dose OCs. Progestin-only pills can rarely be useful to some women for whom estrogen is contraindicated.

**F.** OCs can be used safely until menopause by women who do not have any medical contraindications and who are nonsmokers.

**G.** Smoking with OC use increases risk for myocardial infarction, stroke, and thromboembolic disease, particularly among women older than 35.

**H. Health Benefits of Oral Contraceptives**

**1.** Women taking OCs note that menses become regular and more predictable, dysmenorrhea is reduced, and the number of days and amount of flow decline. In addition, iron stores increase in women with iron deficiency associated with menorrhagia. OCs can restore regular menses in women with abnormal bleeding caused by chronic

anovulation.

2. Benign breast disease, including fibroadenoma and cystic changes, occurs less frequently during OC use.
3. The incidences of pelvic inflammatory disease and ectopic pregnancy are reduced by use of OCs.
4. **Prevention of epithelial ovarian and endometrial cancer**
   a. OC use is associated with 40% reduced risk of ovarian cancer. The protection appears to last for at least 15 years following discontinuation.
   b. Use of OCs is associated with a 50% reduced risk of endometrial cancer, the most common gynecologic cancer.

**I. Metabolic Effects**

1. Estrogen exerts beneficial effects on the serum lipid profile, including an increase in high-density lipoprotein (HDL) cholesterol and a decrease in low-density lipoprotein (LDL) cholesterol.

**J. Cardiovascular Disease**

   a. Nonsmoking OC users, regardless of age, are not at increased risk for myocardial infarction.
   b. Women over 35 years of age who smoke generally should not be prescribed combination OCs because of the increased risk of infarction.

**K. Contraindications to Oral Contraceptives**

1. Carcinoma of the endometrium or other known or suspected estrogen-dependent neoplasia
2. Cerebrovascular or coronary artery disease
3. Cholestatic jaundice of pregnancy or jaundice with prior pill use
4. Heavy cigarette smoking (>15 cigarettes per day) in women older than 35
5. Hepatic adenomas or carcinomas
6. History of deep vein thrombophlebitis or thromboembolic disorders
7. Known or suspected carcinoma of the breast
8. Known or suspected pregnancy
9. Undiagnosed abnormal genital bleeding

**L. Administration of Oral Contraceptives**

1. **Most younger patients and teenagers can be started on** Triphasil-28, LoEstrin 1.5/30, Ortho-Novum 7/7/7, Ortho-Cept, Desogen, Ortho-Cyclen, or Ortho Tri-Cyclen.
2. **Patient Instructions:**
   a. Begin pill on first Sunday after period starts.
   b. If missed pill, take forgotten pill as soon as remembered and take next pill as scheduled.
   c. If 2 missed pills, take 2 pills per day for 2 days, and use backup method for that month.
   d. If 3 missed pills, discontinue and allow withdrawal bleed; resume after 1 week with new pack.
   e. If vomiting within 2 hours of taking pill, repeat dose.

**M. Breakthrough Bleeding**

1. Breakthrough bleeding does not pose a health threat, but it is the most frequent complaint among OC users. Intermenstrual, or breakthrough, spotting and bleeding occur in approximately one quarter of women during the first 3 months of OC use, but it becomes much less common with ongoing use.
2. If intermenstrual bleeding occurs after 3 months of use, the patient

should be examined for possible causes of bleeding unrelated to OC use, including cervical or endometrial infection and neoplasia.

3. If bleeding is occurring early in cycle, change to a lower progesterone (Brevicon, Ovcon 35, Ortho Novum 1/50). If bleeding occurs late in cycle, change to lower estrogen (LoOvral, LoEstrin 1/20).

**N. Acne and Hirsutism**

1. Acne is associated with OCs containing androgenic progestins. OCs containing desogestrel and norgestimate significantly decrease testosterone levels.
2. Desogen, Ortho-Cept, Demulen, Ortho-Cyclen, Modicon, Ovcon-35, and Brevicon are useful because they are less androgenic.

**O. Weight Gain**

1. Weight gain is a particularly large contributor to patient noncompliance.
2. Ortho-Cept, Desogen, Ortho Cyclen, Triphasil, Ortho-Novum 7/7/7 or Jenest 28 may cause less weight gain because they are less androgenic.

**P. Headache**

1. Some women using OCs experience headaches that usually subside after the first 3 cycles. If headaches persist after 3 months, switching to an OC preparation with lower estrogenic and/or lower progestogenic activity may be indicated.
2. LoEstrin 1/20, LoEstrin 1.5/30, Ortho-Cept, or Desogen may be useful in patients who complain of headaches.
3. Some women using OCs experience migraine headaches only during menses, and elimination of the pill-free interval may be therapeutic.

**Q. Nausea**

1. Nausea commonly occurs in OC users. The frequency and severity of usually declines over the first several months of OC use. Taking the pill at bedtime with food often provides relief.
2. Switching to a combination formulation with a lower estrogen dose may prove beneficial. If nausea persists, a preparation with lower progesterone may reduce nausea.

**R. Amenorrhea**

1. Amenorrhea may occur with long-term OC users. Although such amenorrhea is not medically harmful, pregnancy testing and reassurance may be necessary to relieve patient anxiety.
2. If patients continue to be disturbed by amenorrhea, oral estrogen taken with each of the 21 active OC tablets often will restore withdrawal bleeding. Alternatively, another low-dose combination OC can be prescribed.

**S. Hypertension**

1. Even low-dose OCs can cause an increase in blood pressure in some women, blood pressure should be monitored annually in patients taking OCs.
2. Lower progesterone (Brevicon, Ovcon 35, Modicon) pills should be used, discontinue the OCP if hypertension does not resolve.

**T. Menopausal Patients**

1. Switching from OCs to menopausal hormones after age 48 can be accomplished by checking FSH on day 5-7 of menses once yearly. If the level is greater than 30, menopausal hormones should be initiated.
2. Patients over age 52 and amenorrheic for one year, may change to menopausal hormones regardless of FSH.

**U. Other Common Problems**

1. **Loss of libido:** Change to higher androgen (LoOvral, Ovral).
2. **Ovarian Cysts:** Use a monophasic preparation (avoid lower dose triphasic preparations).
3. **Breast Tenderness:** Decrease the progesterone component (Brevicon, Ovcon 35, Modicon).
4. **Fibrocystic Breast Changes:** A pill with lower estrogen should be used (LoEstrin, Lo/Ovral, Orthoceph).
5. **Depression:** Use a lower progesterone (Brevicon, Ovcon 35, Modicon).
6. **Hyperlipidemia:** Change to lower androgen (Orthoceph, Ortho Cyclen, Desogen).

**V. Characteristics of various Oral Contraceptive Preparations:**

1. **Estrogen Content**
   a. **Lowest:** LoEstrin 1/20, LoEstrin (Fe) 1/20. Then, LoEstrin 1.5/30, LoEstrin (Fe) 1.5/30, Levlen, Nordette, Lo/Ovral, Desogen, Orthoceph.
   b. **Highest:** Ovcon 50, Ovral, Demulen 1/50, Norinyl 1+50, Ortho Novum 1/50, TriLevlen, Triphasil.
2. **Progesterone Content**
   a. **Lowest:** Demulen 1/35, Brevicon, Modicon, Ovcon 35.
   b. **Highest:** LoEstrin 1.5/30, LoEstrin (Fe) 1.5/30, Norinyl 1+35, Ortho-Novum 1/35, Ovcon 50.
3. **Androgen Effect**
   a. **Lowest:** Desogen, Orthoceph, Ortho Cyclen, Ortho-Tricyclin.
   b. **Highest:** Levlen, Nordette, TriLevlen, Triphasil 21, Ovral, Lo/Ovral.

**Classification of Oral Contraceptives Based on Composition**

| Type | Preparation | Estrogen (mcg) | Progestin (mg) |
|---|---|---|---|
| **COMBINATION MONOPHASIC** Ethinyl estradiol/ norethindrone<br><br>*as norethindrone acetate | LoEstrin 1/20 | 20 | 1 |
| | LoEstrin (Fe) 1/20 | 20 | 1 |
| | LoEstrin 1.5/30 | 30 | 1.5 |
| | LoEstrin (Fe) 1.5/30 | 30 | 1.5 |
| | Brevicon | 35 | 0.5 |
| | Modicon | 35 | 0.5 |
| | Norinyl 1+35 | 35 | 1 |
| | Ortho-Novum 1/35 | 35 | 1 |
| | Ovcon-35 | 35 | 0.4 |
| | Ovcon-50 | 50 | 1 |
| Ethinyl estradiol/ levonorgestrel | Levlen | 30 | 0.15 |
| | Nordette | 30 | 0.15 |
| Ethinyl estradiol/ norgestrel | Lo/Ovral | 30 | 0.3 |
| | Ovral | 50 | 0.5 |
| Ethinyl estradiol/ ethynodiol diacetate | Demulen 1/35 | 35 | 1 |
| | Demulen 1/50 | 50 | 1 |
| Mestranol/ norethindrone | Norinyl 1 +50 | 50 | 1 |
| | Ortho-Novum 1/50 | 50 | 1 |
| Ethinyl estradiol/ desogestrel | Desogen | 30 | 0.15 |
| | Ortho-Cept | 30 | 0.15 |
| Ethinyl/estradiol/ norgestimate | Ortho-Cyclen | 35 | 0.25 |

| Type | Preparation | Estrogen (mcg) | Progestin (mg) |
|---|---|---|---|
| **BIPHASIC** Ethinyl estradiol/ norethindrone | Ortho-Novum 10/11 | (10 tabs) 35<br>(11 tabs)35 | 0.5<br>1 |
| | Jenest-28 | (7 tabs) 35<br>(14 tabs) 35 | 0.51 |
| **TRIPHASIC** Ethinyl estradiol/ norethindrone | Ortho-Novum 7/7/7 | (7 tabs) 35<br>(7 tabs) 35<br>(7 tabs) 35 | 0.5<br>0.75<br>1 |
| | Tri-Norinyl | (7 tabs) 35<br>(9 tabs) 35<br>(5 tabs) 35 | 0.5<br>1<br>0.5 |
| Ethinyl estradiol/ norgestimate | Ortho Tri-Cyclen | (7 tabs) 35<br>(7 tabs) 35<br>(7 tabs) 35 | 0.18<br>0.215<br>0.25 |
| Ethinyl estradiol/ levonorgestrel | Tri-Levlen | (6 tabs) 30<br>(5 tabs) 40<br>(10 tabs) 30 | 0.05<br>0.075<br>0.125 |
| | Triphasil-21 | (6 tabs) 30<br>(5 tabs) 40<br>(10 tabs) 30 | 0.05<br>0.075<br>0.125 |
| **PROGESTIN ONLY** Norethindrone | MicroNor | ---- | 0.35 |
| | Nor-QD | --- | 0.35 |
| Norgestrel | Ovrette | --- | 0.075 |

## II. Injectable Contraception

### A. Depot Medroxyprogesterone Acetate (DMPA)

1. DMPA acts by inhibiting ovulation; contraceptive efficacy is extremely high.
2. DMPA is given every 3 months, and should be initiated within 5 days of the onset of menses. This approach ensures that the patient is not pregnant and prevents ovulation during the first month of use.
3. After a 150-mg injection of DMPA, ovulation does not occur for at least 3 months and 2 weeks. Therefore, a 2-week grace period exists for women receiving DMPA injections every 3 months. For women more than 2 weeks late for their DMPA injection, pregnancy should be excluded before administering DMPA.
4. Return of fertility will be delayed following discontinuation in 50% of women for up to 10 months of the last injection. Before initiating DMPA, candidates should be counseled about the possible prolonged duration of action. Women who may want to become pregnant within the next 1 or 2 years should not use DMPA.
5. **Side Effects**
   a. Episodes of unpredictable irregular bleeding and spotting lasting 7 days or more are common during the first months of use. With increasing duration of use, the frequency and duration of these episodes decrease, and amenorrhea becomes common. Half of women using DMPA for 1 year report amenorrhea.
   b. Persistent irregular bleeding can be treated with estrogen

supplementation; however, bleeding frequently recurs after discontinuing estrogen.

c. **Other side effects:** Headaches, bloating of the abdomen or breasts, mood changes, and weight gain occur often.

6. **Benefits and Risks**
   a. The tendency of DMPA to cause amenorrhea can make it a particularly appropriate contraceptive choice for women with menorrhagia, dysmenorrhea, or iron deficiency anemia.
   b. DMPA may reduce the risk of pelvic inflammatory disease.
   c. Some women choose DMPA because its use can be concealed from the her partner.
   d. Bone density in long-term DMPA users may be lower than that in nonusers. No clinical evidence of osteoporosis, such as fractures has been noted.

**B. Contraceptive Implants**

1. Levonorgestrel implants (Norplant) consist of six 34 x 2.4 mm soft plastic implants, filled with 36 mg of levonorgestrel each.
2. One third of women using implants experience cyclical menses. These women have a higher risk of pregnancy than those with irregular bleeding or amenorrhea, and these women should be counseled regarding the need for pregnancy testing should menses cease.
3. Insertion of implants within 7 days of the onset of menses ensures that the patient is not pregnant and results in immediate contraception.
4. Insertion and removal of implants are minor office procedures performed using local anesthesia. Instructions are included in the package.
5. **Side Effects**
   a. Most women experience an irregular bleeding pattern during the first year following implant insertion; this proportion declines to one third by the fifth year.
   b. Approximately one third of women experience regular cycles. 5-10% of women experience amenorrhea. Estrogen supplementation can be given to implant users troubled by irregular bleeding.
   c. Some women using implants develop ovarian cysts. Although such cysts may cause lower abdominal discomfort, more often they are asymptomatic and noted incidentally during pelvic examination. These cysts usually resolve spontaneously and should be managed expectantly with follow-up clinical and sonographic examination.

## III. Selection of Methods

**A.** Women remain at increased risk for thromboembolism for several weeks after childbirth. Women who do not breast-feed do not appear to ovulate before 3 weeks postpartum. Based on these observations, some physicians initiate combination OCs in non-breast-feeding women 2 weeks after childbirth; DMPA and contraceptive implants may be initiated immediately post-partum.

**B. Lactating Women**

1. Hormonal contraception may be initiated in lactating women once milk flow is established. Use of combination OCs can reduce the quantity and duration of lactation, although this effect does not appear to cause infant development problems.
2. Progestin-only contraceptives may be an alternative to combination OCs because they do not impair lactation and may increase lactation.

3. DMPA and implants have no adverse impact on lactation

**IV. Use of Concomitant Medications**

**A.** Anticonvulsants and antibiotics that induce hepatic enzymes (eg, phenytoin, carbamazepine, primidone, and rifampin) and can reduce the contraceptive efficacy of OCs and implants.

**B.** Valproic acid, doxycycline and tetracycline do not appear to reduce OC efficacy and do not impair implant efficacy.

**V. Postcoital (Morning-After) Contraception**

**A.** Postcoital contraception within 72 hours of unprotected coitus consists of using Ovral, two pills (containing 50 mcg of estradiol and 0.5 mg of norgestrel each) taken by mouth within 72 hours of unprotected intercourse and repeated 12 hours later; this regimen significantly reduces the pregnancy rate and is safe.

**B.** Prochlorperazine (Compazine) should be prescribed for nausea and vomiting; 5-10 mg PO qid prn nausea.

**C.** If menstruation does not begin when expected, a pregnancy test is appropriate.

# Endometriosis

**I. Pathophysiology**

**A.** Endometriosis is characterized by the presence of endometrial tissue at sites outside the uterine cavity. The ectopic endometrial cells exhibit hormonal responsiveness, and localized bleeding and inflammation and adhesion formation result in cyclical symptoms.

**B.** Early lesions on the peritoneal surface have a "powder burn" appearance, which is a puckered, black area surrounded by a stellate scar. Ovarian endometriosis appears similar to peritoneal lesions or may cause blood-filled cysts termed endometriomas.

**C.** The most common sites are the ovaries, posterior cul-de-sac, uterosacral ligaments, posterior broad ligament, and anterior cul-de-sac. The uterine serosa, rectovaginal septum, cervix, vagina, and rectosigmoid are less frequently involved. The ileum, appendix, cecum, bladder, and ureter are rarely involved.

**II. Clinical Manifestations**

**A. Characteristics of Pelvic Pain of Endometriosis**

1. Secondary dysmenorrhea, with pain usually beginning prior to menses.
2. Deep dyspareunia, typically worse in the perimenstrual phase.
3. Sacral backache with menses.

**B. Patient Characteristics Suggestive of Endometriosis:** Nulliparity, infertility, reproductive age, a first-degree relative with endometriosis, regular menstrual cycles less than 27 days in length with prolonged menses of 8 or more days, and improvement in symptoms during pregnancy.

**C.** The two most common presenting symptoms are pelvic pain and infertility.

**D.** Some patients have diffuse pelvic pain, while some patients have severe disease with no pain. Some patients with mild disease have excruciating pain.

**E.** Perimenstrual tenesmus or diarrhea may indicate rectosigmoid endometriosis; cyclic dysuria or hematuria may indicate bladder endometriosis.

## III. Diagnosis

**A.** Tender nodules are often palpable through the posterior vaginal fornix on bimanual examination and along the uterosacral ligaments on rectovaginal examination. Cystic ovarian enlargement, fixation of the adnexal structures, and uterine retrodisplacement may also be seen.

**B.** Endometriosis can be definitively diagnosed only by pathologic examination of specimens or by direct visualization of lesions.

**C.** Ultrasound may be helpful if ovarian enlargement is present. On ultrasound imaging, ovarian endometriomas typically appear as large cysts containing, homogeneous internal echoes.

## IV. Treatment of Endometriosis

**A.** Prostaglandin inhibitors and hormone therapy are used for relief of pain with varying results.

Naproxen (Naprosyn) 500 mg followed by 250 mg PO q6-8h prn [250, 375,500 mg].
Naproxen sodium (Aleve OTC) 200 mg PO tid.
Naproxen sodium (Anaprox) 550 mg followed by 275 mg PO tid-qid prn.
Ketoprofen (Orudis) 50 mg PO tid-qid prn [25,50,75 mg].
Ibuprofen (Motrin) 400 mg PO q4-6h prn.
Mefenamic acid (Ponstel) 500 mg PO followed by 250 mg q6h prn.
Piroxicam (Feldene) 20 mg PO qd-bid prn.

**B. Combined Estrogen-Progestin:** Low-dose, combination, monophasic birth control pills often relieve mild to moderate pelvic pain in patients with mild disease; they should be taken in a continuous or cyclic manner.

**C. Progestin Only Regimen:** Medroxyprogesterone acetate (Provera), 10-30 mg/d orally produces significant pain relief; however, frequent breakthrough bleeding and occasional depression limit usefulness.

**D. Danazol**

1. This weak androgen suppresses estrogen levels resulting in atrophy of endometriotic implants. Dosages of 200-400 mg orally twice daily for 3-6 months should relieve pain.
2. Side effects include mild elevation of liver enzymes, significant reduction in high-density lipoprotein cholesterol, weight gain, edema, decreased breast size, oily skin, acne, and hirsutism. Most changes are reversible; however, permanent voice changes have occurred.

**E. Gonadotropin-Releasing Hormone Agonists**

1. Gonadotropin-releasing hormone (GnRH) agonists are potent inhibitors of gonadal function. After a transient (2-week) stimulation, hypoestrogenism results.
2. Pain related to endometriosis is relieved in most patients by the second or third month of therapy.
3. Intramuscular leuprolide 3.75 mg once monthly, or nafarelin, 200 mg nasal spray twice daily for 3-6 months provide improvement of symptoms.
4. Hypoestrogenic side effects such as loss of bone mineral density, hot flashes, headaches, and depression occur. Low-dose estrogen plus progestin or progestin without estrogen may reduce side effects.

**F. Conservative Surgical Therapy:** Mild endometriosis is usually treated

surgically at the time of diagnosis by laparoscopic cautery.

**G. Laparotomy**

1. When preservation of childbearing potential is desirable or infertility exists, conservative surgery may result in increased fecundity via cautery or vaporization of all visible implants, lysis of adhesions, and restoration of normal pelvic anatomy.
2. Presacral neurectomy may be considered if dysmenorrhea, deep dyspareunia, or perimenstrual sacral backache are refractory to therapy.

**H. Definitive Surgery:** Hysterectomy with bilateral oophorectomy is the definitive treatment for endometriosis.

## Acute Pelvic Pain

**I. Clinical Evaluation**

**A.** The clinical evaluation of acute pelvic pain should include the patient's age, obstetrical history, menstrual history, characteristics of pain onset, duration, and palliative or aggravating factors.

**B.** Associated symptoms may include urinary or gastrointestinal symptoms, fever, abnormal bleeding, or vaginal discharge.

**C. Past Medical History:** Determine contraceptive history, surgical history, gynecologic history, history of pelvic inflammatory disease, ectopic pregnancy, sexually transmitted diseases.

**D. Social History:** Current sexual activity and practices should be assessed.

**E. Method of Contraception**

1. Sexual abstinence in the months preceding the onset of pain may help exclude pregnancy-related etiologies.
2. The risk of acute PID may be reduced by 50% in patients taking oral contraceptives or using a barrier method of contraception. Patients taking oral contraceptives are at decreased risk for an ectopic pregnancy or the complications of ovarian cysts because they are not ovulating.
3. An intrauterine device (IUD) may be a risk factor for acute PID. A pregnancy that occurs with an IUD in place has 10-fold increased risk of being ectopic.

**F. Risk Factors for Acute PID:** Age between 15-25 years, use of an intrauterine device, male sexual partner with symptoms of urethritis, prior history of acute PID.

**II. Physical Examination**

**A.** Fever, abdominal and pelvic tenderness, peritoneal signs should be sought.

**B.** Vaginal discharge, cervical erythema and discharge, cervical and uterine motion tenderness, or adnexal masses or tenderness should be noted.

**III. Laboratory Tests**

**A. Pregnancy Tests** help to identify those patients with pregnancy-related causes.

1. **Serum Pregnancy Tests**
   a. **Quantitative Radioimmunoassay** is the most sensitive pregnancy test available; it detects hCG levels as low as 5 mIU/mL

and becomes positive 7-9 days after conception. A negative test virtually excludes the diagnosis of ectopic pregnancy.

b. **Qualitative Tests** have a high sensitivity and are positive at hCG levels of 10-25 mIU/mL.

c. **Urine Pregnancy Tests:** Ultrasensitive tests are positive in 80-85% of ectopic pregnancies. Monoclonal antibody tests are positive in 96-100% of ectopic pregnancies.

**B. Complete Blood Count:** Lacks sensitivity and specificity. Leukocytosis suggest an inflammatory process. A normal white blood count occurs in 56% of patients with acute PID and 37% of patients with acute appendicitis.

**C. Erythrocyte Sedimentation Rate** is a nonspecific sign of inflammation.

**D. Urinalysis:** The finding of pyuria suggests urinary tract infection. Pyuria can occur with an inflamed appendix in a posterior position, or from contamination of the urine by purulent vaginal discharge.

**E. Cervical Gram Stain:** In the setting of acute pelvic pain, this test only has a sensitivity for gonococcal infection of 68% and a specificity of 98%; gram-negative intracellular cocci are seen with three or more neutrophils. A positive result is supporting evidence for the diagnosis of PID.

**F. Tests for Neisseria gonorrhoeae and Chlamydia trachomatis**: Laboratory confirmation of gonorrhea or Chlamydia trachomatis is by culture. Nonculture methods are also available.

**G. Pelvic Ultrasonography**

1. The finding of an extrauterine gestational sac confirms the diagnosis of ectopic pregnancy, but this is seen on transabdominal sonography in only 15% of cases. Ultrasound is of greater value in excluding the diagnosis of an ectopic pregnancy by demonstrating an intrauterine gestation. Transvaginal sonography has a greater diagnostic accuracy for ectopic pregnancy.
2. Sonography may have an adjunctive diagnostic role in cases of suspected acute PID, torsion of the adnexa or acute appendicitis.
3. **Diagnostic Laparoscopy:** Indicated when acute pelvic pain has an unclear diagnosis despite comprehensive evaluation.

## III. Differential Diagnosis of Acute Pelvic Pain

**A. Pregnancy-Related Causes:** Ectopic pregnancy, abortion (spontaneous, septic, threatened or incomplete), intrauterine pregnancy with corpus luteum bleeding

**B. Gynecologic Disorders:** PID, endometriosis, ovarian cyst hemorrhage or rupture; adnexal torsion, Mittelschmerz, uterine leiomyoma degeneration or torsion; primary dysmenorrhea; tumor

**C. Nonreproductive Tract Causes**

1. **Gastrointestinal:** Appendicitis, inflammatory bowel disease, mesenteric adenitis, irritable bowel syndrome, diverticulitis
2. **Urinary Tract:** Urinary tract infection, renal calculus

## IV. Diagnostic Approach to Acute Pelvic Pain with a Positive Pregnancy Test

**A.** In a female patient of reproductive age, presenting with acute pelvic pain, the first distinction is whether the pain is pregnancy-related or non-pregnancy related on the basis of a serum pregnancy test.

**B.** In the patient with acute pelvic pain associated with pregnancy, the next step is localization of the tissue responsible for the hCG production.

**C.** Transvaginal ultrasound should be performed to identify the possibility of intrauterine gestation. A noncystic adnexal mass and fluid in the cul-de-sac are associated with ectopic pregnancy.

**D. If a gestational sac is not demonstrated on ultrasonography, the following possibilities exist**

1. **Ectopic pregnancy**
2. **Very early intrauterine pregnancy** not seen on ultrasound
3. **Recent abortion**
4. **False-positive pregnancy test** (very rare)

**E. If a gestational sac is not seen, three management options should be considered in patients with a positive pregnancy test**

1. **Expectant Management with Close Clinical Follow-up**
   - **a.** This option is appropriate for stable patients with mild symptoms in whom the diagnosis of ectopic pregnancy remains uncertain. Quantitation of hCG titer and serial ultrasound examinations should be done.
   - **b.** The "hCG discriminatory zone," indicates the absolute hCG titer above which an intrauterine gestation sac should be seen, and if an intrauterine sac is not seen, an ectopic pregnancy is highly likely, and surgery is indicated. The hCG discriminatory is 6,000 mIU/mL with transabdominal sonography and as low as 1000 or 1600 mIU/mL with transvaginal sonography.
   - **c.** For patients stable with hCG titers below the discriminatory zone, serial measurements of the hCG titer can be used to identify patients with abnormal, nonviable pregnancies.
2. **Diagnostic laparoscopy** is the most accurate and rapid way of establishing or excluding the diagnosis of ectopic pregnancy.
3. **Examination of Endometrial Tissue:** For pregnant patients desiring termination, and for those patients in whom it can be demonstrated that the pregnancy is nonviable, suction curettage with immediate histologic examination of the curettings is a diagnostic option. Chorionic villi confirms the diagnosis of intrauterine pregnancy, whereas the absence of such villi presents a high risk for ectopic pregnancy.

## V. Management of the Ectopic Gestation

**A. Fluid Replacement:** 2 IV catheters of at least 18 gauge and infuse NS or LR 1-2 L over 1-2h.

**B. Laparoscopy or laparotomy** with linear salpingostomy or salpingectomy postoperative should be accomplished. An HCG level should be checked in one week.

**C. Medical:** Expectant management may be chosen if the gestational sac is less than 3 cm diameter, and the Fallopian tube is unruptured, and the HCG <1,000 mIU/mL. Closely follow clinical course and serial HCG's.

**D. Methotrexate Therapy**

1. **Selection criteria** include a desire for future fertility; HCG <15,000 mIU/mL; ectopic fully visualized and <3 cm; tubal serosa intact; no active bleeding.
   - **a. Contraindications:** WBC <3,000; platelets <100,000; elevated creatinine or AST; poor patient compliance; history of active peptic ulcer, liver or renal disease; fetal cardiac activity.
   - **b. Dosage of Methotrexate:** Single injection of 50 mg/m$^2$ . Follow qualitative beta-HCG levels for decline.

**VI. Acute Pelvic Pain in Non-Pregnant Patients with a Negative Pregnancy Test**

**A. Acute PID** is the leading diagnostic consideration in patients with acute pelvic pain unrelated to pregnancy. The pain usually bilateral, but may be unilateral in 10%.

**B. Diagnostic Criteria for PID:** Lower abdominal pain, cervical motion tenderness and adnexal tenderness on examination, plus at least one of the following:

1. Fever exceeding 38°C
2. White blood count exceeding 10,500/$mm^3$
3. Purulent fluid obtained on culdocentesis
4. An inflammatory mass on pelvic ultrasonography
5. Elevated erythrocyte sedimentation rate
6. Positive endocervical Gram stain for gonococci
7. Positive test for C trachomatis
8. More than 5 white blood cells per oil immersion field on Gram stain of cervical discharge.

**C. Acute appendicitis** should be considered in all patients presenting with acute pelvic pain and a negative pregnancy test. Appendicitis is characterized by leukocytosis and a history of a few hours of periumbilical pain followed by migration of the pain to the right lower quadrant; neutrophilia occurs in more than 75%. A slight temperature elevation exceeding 37.3°C, nausea, vomiting, anorexia, and direct rebound pain may be present.

**D. Torsion of the Adnexa:** Usually causes unilateral pain, but can be bilateral in 25%. Intense, progressive pain combined with a tense, tender, adnexal mass is characteristic. There is often an antecedent history of repetitive, transitory pain. Pelvic sonography often confirms the diagnosis. Laparoscopic diagnosis and surgical intervention are indicated.

**E. Ruptured or Hemorrhagic corpus luteal cyst** usually causes bilateral pain but can cause unilateral tenderness in 35%. Ultrasound aids in diagnosis.

**F. Endometriosis** usually causes chronic or recurrent pain, but it can occasionally cause acute pelvic pain. There usually is a history of infertility, dysmenorrhea and deep dyspareunia. Pelvic exam reveals fixed uterine retrodisplacement and tender uterosacral and cul-de-sac nodularity. Definitive diagnosis requires laparoscopy.

**VII. Diagnostic Dilemmas:** Some patients with acute pelvic pain will continue to have an unclear diagnosis and management may include the following:

**A. Expectant management** with close clinical follow-up. Patients should be followed clinically until either the symptoms resolve or the diagnosis becomes apparent, or until laparoscopy is completed.

**B. Therapeutic trial of antibiotics** for presumed acute PID may be considered with close clinical follow-up.

**C. Diagnostic laparoscopy** should be done if there is a risk of a surgical emergency, or if there has been a failure of a therapeutic trial of antibiotics for suspected acute PID, or if symptoms are persistent or worsening.

# Amenorrhea

Amenorrhea may be associated with infertility, endometrial hyperplasia or osteopenia and may be the presenting sign of an underlying metabolic, endocrine, congenital, or more serious gynecologic disorder.
The prevalence of secondary amenorrhea is higher in college students (3-5%), competitive endurance athletes (5-60%), and ballet dancers (19-44%).

## I. Pathophysiology of Amenorrhea

- **A.** Amenorrhea may be caused by either failure of the hypothalamic-pituitary-gonadal axis, or by absence of end organs, or by obstruction of the outflow tract. The underlying etiology of amenorrhea should always be determined.
- **B.** Menses usually occur at intervals of 28 ± 3 days, with a normal range of 18-40 days.
- **C.** Amenorrhea is defined as the absence of menstruation for 3 or more months in a women with past menses (secondary amenorrhea) or the absence of menarche by the age of 16 years in girls who have never menstruated (primary amenorrhea). The duration of amenorrhea that is considered pathologic is arbitrary, and any woman who has concerns should be evaluated.
- **D.** Pregnancy is the most common cause of amenorrhea, and it should always be excluded with a urine or serum pregnancy test.
- **E.** **Cyclic menstrual bleeding** requires normally functioning ovaries, a uterus with a responsive endometrium, an unobstructed outflow tract, and an intact hypothalamic-pituitary-ovarian axis.
- **F.** Aside from pregnancy, the most common causes of amenorrhea involve disorders within the hypothalamic-pituitary-ovarian axis.

## II. Clinical Evaluation of Amenorrhea

### A. History

1. Establish the timing of pubertal milestones, and assess lifestyle changes, dietary and exercise habits, medications or drugs, and evaluate environmental and psychologic stress.
2. Prolonged, intense exercise can lead to amenorrhea and is often associated with disordered eating. A detailed nutritional assessment will detect the presence of an eating disorder.
3. Previous pelvic surgery and evidence of increased androgen (acne, hirsutism, temporal balding, deepening of the voice, increased muscle mass, and decreased breast size) should be sought.
4. Evidence of decreased estrogen includes hot flushes, night sweats, and dyspareunia.

### 5. Important Historical Points for Evaluation of Amenorrhea

**Menstrual History**
Age at menarche
Date of last menstrual period
Previous menstrual pattern
**Events surrounding the onset of amenorrhea**
Athletic training
Depression
Stress
Weight gain or loss
**Reproductive History**
Contraceptive use
Gynecologic or obstetric procedures
Pregnancies: outcomes, complications
Pubertal development

**General Medical History**
Endocrine or metabolic disorders
Galactorrhea
Medications
Past or present serious illnesses
Previous radiation therapy or chemotherapy
Recent weight gain or loss
**Family History**
Age of mother and sister(s) at menarche and menopause
Autoimmune disorders
Endocrinopathies
Menstrual dysfunction
Tuberculosis

### 6. Drugs Associated with Amenorrhea

**Drugs That Increase Prolactin**
Antipsychotics
- Phenothiazines
- Haloperidol (Haldol)
- Pimozide (Orap)
- Clozapine (Clozaril)

Tricyclic antidepressants
Antihypertensives
- Calcium channel blockers
- Methyldopa (Aldomet)

**Drugs with Estrogenic Activity**
Digitalis
Marijuana
Flavenoids
Oral contraceptives
**Drugs with Ovarian Toxicity**
Busulfan
Cisplatin
Cyclophosphamide (Cytoxan)
Fluorouracil

## B. Physical Examination

1. Breast development and pubic hair distribution are good indicators of exposure to estrogens and sexual maturity. The breasts should be examined for galactorrhea.
2. The thyroid is palpated for enlargement and nodules. Abdominal striae in a nulliparous woman may indicate hypercortisolism (Cushing's Syndrome).
3. Assess the distribution and extent of androgen-stimulated body hair. The overall hair distribution may reveal signs of androgen excess. The absence of both axillary and pubic hair in a phenotypically normal female suggests complete androgen insensitivity.
4. The external genitalia and vagina should be inspected for signs of estrogen deficiency or androgen excess. An imperforate hymen or vaginal septum can cause mechanical blockage of the outflow tract and prevent menstrual flow.
5. Palpation of the uterus and ovaries assures their presence and detects gross abnormalities.

**6. Signs and Symptoms of Estrogen and Androgen Imbalance**

| | |
|---|---|
| **Low Estrogen** | Dry, atrophic vaginal mucosa, dyspareunia<br>Scant cervical mucus<br>Parabasal cells on vaginal cytology<br>No withdrawal bleeding with progesterone challenge<br>Vasomotor instability<br>Mood swings and irritability<br>Menstrual irregularities; anovulation |
| **High Estrogen** | Abundant superficial cells on vaginal cytology<br>Menstrual irregularities; anovulation |
| **High Androgen** | Truncal obesity: waist to hip ratio >0.85<br><br>Hirsutism<br>Acne<br>Male-pattern baldness<br>Enlarged clitoris (>1 cm) |

**III. Diagnostic Approach to Amenorrhea**

**A.** In the presence of otherwise normal development, the same basic evaluation should be used for both primary and secondary amenorrhea unless an obvious cause of primary amenorrhea is discovered by history or physical examination.

**B.** Patients 14 years of age or older with primary amenorrhea and lack of development of secondary sexual characteristics should undergo a work-up for congenital abnormalities.

**C.** The production of menstrual flow requires an intact hypothalamic-pituitary-ovarian axis, a hormonally responsive uterus, and an intact outflow tract. The most important task in the evaluation of amenorrhea is to identify the malfunctioning element. The evaluation strategy localizes the abnormality to either the uterus, ovary, anterior pituitary or hypothalamus.

**D. Step One--Rule Out Pregnancy**

**1.** Pregnancy is the most common cause of secondary amenorrhea and must always be ruled out with a pregnancy test before proceeding with diagnostic evaluation.

**E. Step Two--Exclude Hyperthyroidism and Hyperprolactinemia**

**1.** Both hypothyroidism and hyperprolactinemia can cause amenorrhea, and they can be easily excluded by a normal serum thyroid-stimulating hormone (TSH) and prolactin.

**2. Hyperprolactinemia:**

**a.** Prolactin inhibits the pulsatile secretion of gonadotropin-releasing hormone. About one-third of women with no obvious cause of amenorrhea have an elevated prolactin level.

**b.** If the basal prolactin level is elevated (>20 ng/ml) on initial testing, review the patient's medications. Repeat the test with the patient in a relaxed, fasting state because prolactin levels may be increased by stress, exercise, anxiety, sleep, and food ingestion.

**c.** Amenorrheic women with an elevated prolactin level should undergo an magnetic resonance imaging (MRI) to rule out pituitary tumor.

**F. Step Three--Assess Estrogen Status**

**1.** After initial screening, the **progesterone challenge test** should be used to determine estrogen status in patients who are not pregnant. This test also determines the competence of the uterine outflow tract.

**2.** The protocol calls for medroxyprogesterone (Provera) 10 mg orally once a day for 10 consecutive days. Any uterine bleeding within 2-7 days after the completion of the medroxyprogesterone is considered a positive test. A positive result suggests chronic anovulation, rather than hypothalamic-pituitary insufficiency or ovarian failure.

**3.** A negative test indicates either an incompetent outflow tract, nonreactive endometrium, or inadequate estrogen stimulation.

**a.** To rule out an abnormality of the outflow tract, a regimen of conjugated equine estrogens, 1.25 mg taken daily on days 1 through 21 of the cycle, is prescribed.

**(1)** Medroxyprogesterone, 5 to 10 mg, is then given on the last 5 days of the 21-day cycle. (A combination oral contraceptive agent can also be used instead of the estrogen/progesterone regimen.)

**(2)** Withdrawal bleeding within 2-7 days of the last dose of progesterone confirms the presence of an unobstructed outflow tract and a normal endometrium, and the problem is localized to the

hypothalamic-pituitary axis or ovaries, and anatomic causes are excluded.

4. In patients who have had prolonged amenorrhea, an endometrial biopsy should be considered before withdrawal bleeding is induced. Biopsy can reveal endometrial hyperplasia or precancerous precursors in addition to assessing ovulatory status.
5. In rare situations, there is adequate circulating estrogen but the endometrium will not respond to progesterone withdrawal. This can occur with adrenal tumors or hyperandrogenic chronic anovulation, or when a rare adrenal enzyme deficiency results in abnormally high levels of progesterone. In such cases, patients can be recognized by signs of hyperandrogenism.

**G. Step Four--Evaluation of Hypoestrogenic Women**

1. The fourth step in the diagnostic investigation is appropriate for women with hypoestrogenic amenorrhea, as indicated by a negative progesterone withdrawal test and a competent outflow tract (as indicated by a positive response to the estrogen/progesterone test).
2. Serum follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels should be measured to localize the problem to the follicle, pituitary or hypothalamus.
3. **Ovarian Failure**
   a. Elevated gonadotropins and a low estrogen level indicate ovarian failure.
   b. Ovarian failure is considered "premature" when it occurs in women less than 40 years of age.
   c. A LH or FSH level greater than 50 mIU/mL reliably indicates of ovarian failure. In the perimenopausal period, FSH rises prior to the rise in LH.
4. **Pituitary or Hypothalamic Dysfunction**
   a. Normal or low gonadotropin level and a low estrogen level is indicative of pituitary or hypothalamic failure. An MRI is the most sensitive imaging study of the sella turcica to rule out a tumor of the pituitary gland.
   b. If MRI does not reveal a tumor, a defect in pulsatile GnRH from the hypothalamus is the probable cause of amenorrhea.

## IV. Management of Women with Amenorrhea due to Chronic Anovulation with Adequate Estrogen

**A.** Adequate estrogen and anovulation is indicated by withdrawal bleeding with the progesterone challenge test. Progesterone is not being adequately produced.

**B.** There is often a history of weight loss, increased psychosocial stress, or excess exercise. Women usually have a normal or low body weight and normal secondary sex characteristics. TSH and prolactin are normal.

1. Reducing stress and adequate nutrition may be effective in inducing ovulation.
2. These women are at increased risk for endometrial cancer because of the hyperplastic effect from unopposed estrogen.
3. Treatment must include cyclic progesterone to induce withdrawal bleeding. Medroxyprogesterone, 10 mg per day for the first 7-10 days of every month should be prescribed. If contraception is desired, a low-dose cyclic oral contraceptive may be used instead.

4. If pregnancy is desired, ovulation may be induced with clomiphene (Clomid).

## V. Management of Hypothalamic Dysfunction

**A.** Amenorrheic women with a normal prolactin level, no withdrawal bleeding from a progesterone challenge (but with a positive response to estrogen/progesterone), with low or normal gonadotropin levels, and with a normal sella turcica imaging are considered to have amenorrhea secondary to hypothalamic dysfunction. These women do not have adequate estrogen or progesterone levels.

**B.** Hypothalamic amenorrhea usually results from psychologic stress, depression, severe weight loss, anorexia nervosa or strenuous exercise. Inadequate pulsatile GnRH stimulation of the pituitary gland is observed in these patients.

**C.** Athletic-related amenorrhea is usually reversible within a few months of decreased training. In anorexic patients, amenorrhea can be more persistent despite weight gain.

**D. Hormone Therapy for Hypoestrogenic Women**

1. All hypoestrogenic women are at a significantly greater risk for the development of osteoporosis and cardiovascular disease.
2. Oral contraceptives may be more appropriate to prevent bone loss in young women.
3. Premenopausal women should take conjugated estrogen, 0.625 mg with medroxyprogesterone (Provera) 2.5 mg every day of the month.
4. Calcium supplementation (1,500 mg per day) is also recommended.
5. Contraception should be used by sexually active women who do not desire pregnancy because pregnancy may still occur in up to 10%.

## VI. Management of Disorders of the Outflow Tract or Uterus

**A. Intrauterine Adhesions (Asherman syndrome)**

1. Asherman's syndrome is the most common outflow-tract abnormality that causes amenorrhea. Intrauterine adhesions occur most commonly after curettage in the postpartum period.
2. Infertility and menstrual dysfunction are the most frequent symptoms. This disorder should be considered if oligomenorrhea or amenorrhea develop following curettage, or after bacterial or tuberculous endometritis.
3. If adhesions are present on hysterosalpingography, hysteroscopy should be performed, with direct lysis of adhesions. After this treatment, normal menses occur in 90%. Hysteroscopic lysis prevents tubal damage and adhesions caused by intra-abdominal menstrual blood.

**B. Imperforate Hymen, Vaginal and Uterine Aplasia, or Vaginal Septa**

1. A bulging perineum and a pelvic mass are commonly present.
2. An imperforate hymen can be opened with a scalpel.

## VII. Management of Disorders of the Ovary

**A.** Ovarian failure should be considered if menopausal symptoms occur, especially hot flushes or dyspareunia.

**B.** Women with the diagnosis of premature ovarian failure who are less than 30 years of age should undergo karyotyping to rule out the presence of a Y chromosome. If a Y chromosome is detected, the patient should be evaluated for the presence of testicular tissue, and if present, the tissue should be removed.

**C.** Women between 30-40 years of age with ovarian failure can usually be assumed to have premature ovarian failure and normal chromosomes.

**D.** Twenty to 40 percent of cases of premature ovarian failure are associated with autoimmune disorders. Therefore, an evaluation for autoimmune diseases is recommended for patients diagnosed with premature ovarian failure.

**E. Laboratory Work-Up of Patients with Premature Ovarian Failure**

| Recommended | Consider |
|---|---|
| Thyroid-stimulating hormone (TSH)<br>Free T4<br>Thyroid antibodies<br>Morning cortisol level<br>Calcium<br>Phosphorus | Complete blood count (CBC)<br>Erythrocyte sedimentation rate (ESR)<br>Anti-nuclear antibodies (ANA)<br>Rheumatoid factor (RF)<br>Total protein, albumin: globulin ratio |

**F.** Adrenal failure can follow ovarian failure, so adrenal function surveillance should be considered.

**G.** Patients with ovarian failure should be prescribed estrogen 0.625 mg with progesterone 2.5 mg daily on every day of the month with calcium as described above.

## VIII. Disorders of the Anterior Pituitary

**A.** Anterior pituitary dysfunction is most often due to intrinsic pituitary tumors, most commonly pituitary adenomas.

**B.** Up to one-third of cases of secondary amenorrhea are caused by a prolactin-secreting adenoma.

1. **Prolactin-secreting Macroadenomas** require either shrinkage using bromocriptine (Parlodel) or surgical removal.
2. Bromocriptine is recommended for individuals with microadenomas (<10 mm in diameter) and for those with no radiographic evidence of a pituitary lesion. Initial therapy for macroadenomas consists of bromocriptine for at least 6 months. Surgery may be considered later.

## IX. Hyperandrogenic Chronic Anovulation (Polycystic Ovarian Syndrome)

**A.** Hyperandrogenic chronic anovulation is the term used to describe what was previously known as polycystic ovary syndrome. This condition is an anovulatory state associated with androgen excess; only 70% of patients with this syndrome have polycystic ovaries.

**B.** Hyperandrogenic chronic anovulation is present in 37% of amenorrheic women.

**C.** This disorder generally presents with amenorrhea, hirsutism, and obesity from puberty, but may also present with irregular and profuse uterine bleeding; it may not always be associated with hirsutism or obesity.

**D.** The characteristic abnormalities are hyperandrogenism and hyperestrogenism.

**E.** If basal prolactin, TSH, and FSH levels are within the normal ranges or even low, then serum and free testosterone levels, and dehydroepiandrosterone sulfate levels should be determined.

**F.** Increased levels of testosterone and dehydroepiandrosterone sulfate (DHEA-S) imply hyperandrogenic chronic anovulation; however, circulating

androgen levels are sometimes normal in this disorder. Increased circulating levels of LH (>20 mIU/ml) or an LH/FSH ratio >2.5 may also aid in diagnosing this disorder.

**G.** Women with hyperandrogenic chronic anovulation have 3 times the risk of hypertension and 6 times the risk of type II diabetes mellitus.

**H.** They also often have abnormal lipid profiles, and a sevenfold increased risk of developing coronary heart disease. Weight loss, exercise and dietary modifications should be recommended.

**I.** Treatment aims to resolve infertility, control hirsutism, and prevent endometrial hyperplasia from unopposed estrogen secretion.

**X. Androgen Secreting Neoplasms**

**A.** In women with evidence of hirsutism or virilization, both total testosterone and DHEA-S levels should be determined.

**B.** Total testosterone levels >200 ng/ml or DHEA-S levels >7.0 ng/dL should lead to an investigation for an androgen-secreting neoplasm.

**XI. Cushing's Syndrome**

**A.** An estimate of cortisol secretion is indicated in women with amenorrhea who present with stigmata of Cushing syndrome (truncal obesity, striae).

**B.** Basal level of 17-hydroxyprogesterone or 24-hour urinary excretion of pregnanetriol is warranted if 21-hydroxylase deficiency is suspected. Some degree of sexual ambiguity may be present.

**XII. Androgen Insensitivity Syndrome (Testicular feminization syndrome)**

**A.** This disorder is suggested by significant breast development in the absence of a normal amount of pubic and axillary hair, and by the presence of a blind ending or absent vagina.

**B.** These patients usually present during adolescence with primary amenorrhea, and they will not bleed in response to a progesterone/estrogen test.

**C.** This disorder is confirmed by karyotype.

# Menopause

The average age of menopause is 49 years, with a range of 41-55. Menopause before age 41 is considered premature. Menopause is often diagnosed by irregular menses accompanied by hot flashes and an elevated follicle-stimulating hormone (FSH) level.

In the period before menopause, irregular menses begin to occur--shortening, then lengthening, then cessation of menses.

**I. Climacteric Syndromes**

**A. Hot Flushes**

**1.** Hot flushes are the most frequently occurring climacteric symptom, and they are characterized by episodic occurrence of sudden skin flushing and perspiration.

**2.** Hot flush frequency varies from less than one daily to 3 episodes per hour; the duration is usually 3-4 minutes.

**B. Lower Urinary Tract Atrophy**

**1.** After menopause, atrophic changes occur in the urethra and periurethra. Loss of pelvic tone and prolapse of the urethrovesicular

junction occurs.

2. Dysuria, urgency, frequency, suprapubic discomfort, stress, and urge incontinence are frequent.

**C. Genital Changes**

1. Shortening of the vaginal canal, loss of rugae, epithelial thinning and friability, and bacterial vaginoses are common.
2. Atrophic vaginitis, dyspareunia, vaginal bleeding may occur.

**D. Osteoporosis**

1. Menopause is associated with decreased bone mass and increased susceptibility to fractures; estrogen supplementation decreases hip and vertebral fracture risk by 50%.
2. Hormone therapy initiated long after menopause stabilizes bone mass in women who have delayed using hormonal therapy.

**E. Cardiovascular System:** Estrogen replacement offers protection from cardiovascular disease in menopausal women.

## II. Laboratory Tests

**A.** Laboratory tests are sometimes indicated to exclude or confirm other diagnoses that may cause amenorrhea (thyroid disease, hyperprolactinemia, pregnancy).

**B.** Menopause may be confirmed by a FSH serum level greater than 25 mIU/mL.

**C.** A lipid profile, Pap smear, mammogram, and stool guaiac are often indicated for routine screening.

**D.** Bone density measurements are not usually needed. For woman who are undecided about hormone replacement therapy, a bone density test (dual-energy x-ray absorptiometry) can help the patient to make a more informed decision.

## III. Overview of Menopause Treatment

**A.** Women who are still menstruating are eligible for hormone replacement therapy (HRT) if perimenopausal and troubled by symptoms of menopause.

**B.** Skin thickness and collagen content are increased by estrogen replacement. Estrogen replacement reduces the risk of Alzheimer's disease.

**C.** Estrogen replacement should be continued indefinitely, because stopping therapy results in rapid loss of bone. There is no upper age limit for starting estrogen replacement.

**D. Breast Cancer Risk:** Breast cancer risk is not significantly increased by hormone therapy in women who do not have a family history of breast cancer. However, estrogen therapy is not recommended in women with a family history of breast cancer.

## IV. Contraindications to the Use of Non-Contraceptive Estrogens

**A. Absolute**

1. Previously diagnosed or suspected breast cancer
2. Previously diagnosed or suspected endometrial cancer
3. Active liver disease
4. Active thromboembolic disease
5. Family history of breast cancer

**B. Relative**

1. Recently active endometriosis or history of severe endometriosis
2. History of thromboembolic disease related to estrogen

3. Obesity

C. Therapy is not contraindicated in women with fibroids, hypertension, diabetes or cigarette smoking. Therapy should not be withheld from women who have not had a Pap smear.

## V. Hormone Replacement Therapy Regimens

### A. Estrogen and Progestogen Therapy For Patients With Uterus Present

1. Estrogen should be administered daily (continuous regimen). An interruption of therapy at the end of each month (cyclic regimen) is not necessary.
2. Progestins should be added to postmenopausal hormone regimens to prevent endometrial hyperplasia and to minimize the risk of uterine cancer. Progesterone is not indicated for women without a uterus.
3. **Continuous Therapy**
   a. **Estrogen:** Conjugated estrogens (Premarin) 0.625 mg PO daily.
   b. **Progesterone:** Medroxyprogesterone acetate (Provera), 2.5 mg daily, in a continuous fashion.
   c. Some spotting and bleeding is expected initially, but amenorrhea occurs in approximately 40% of women within 3 months.
   d. In women who continue to experience spotting or bleeding 3 months after the start of continuous estrogen replacement therapy, the dosage of medroxyprogesterone may be increased to 5 mg daily. If bleeding continues after 6 months of the 5-mg dosage of medroxyprogesterone, the dosage may be increased to 10 mg per day.
   e. Follow-up endometrial biopsies are not routinely necessary. If irregular bleeding occurs after the establishment of amenorrhea, endometrial biopsy or dilatation and curettage are necessary.
4. **Cyclical Therapy**
   a. Conjugated estrogens (Premarin), 0.625 mg, on days 1 through 25, and medroxyprogesterone (Provera), 5 to 10 mg on days 12 through 25.
   b. An easier cyclic schedule is estrogen every day of month, with progesterone added for first 2 weeks.

### B. Hormone Replacement Side Effects

1. Gastrointestinal symptoms due to estrogen (nausea) may respond to a switch to transdermal estrogen, 0.5 mg patch twice weekly.
2. Progestogens are associated with bloating, cramping, and irritability. Decreasing the daily progestogen dosage or taking it on alternate days may help alleviate these symptoms.

## VI. Estrogen-Only Therapy

**A. Uterus Removed:** Continuous daily estrogen-only therapy is recommended if a uterus is not present.

B. Estrogen doses are the same as those given above.

## VII. Additional Menopausal Therapy

### A. Calcium and Vitamin D

1. Calcium intake should be at least 1,000 mg/day, including dietary intake. Calcium supplementation is necessary for most women, especially those with poor dietary intake, but it is unnecessary for women with adequate intake of milk and dairy products.
2. Vitamin D at 400 IU per day is recommended for patients with limited

exposure to sunshine who do not drink Vitamin D fortified milk (especially elderly nursing home residents). Vitamin D has no benefit for other women.

**B. Exercise:** Healthy woman should exercise at least three times a week for 30 minutes.

## Atrophic Vaginitis

**History:** Menopausal; vaginal soreness, burning, spotting, dyspareunia, discharge.
**Physical:** Thin vaginal mucosa, few rugal folds, inflammation, diffuse redness, edema.
**Labs:** Many WBC's, absent lactobacilli, many gram negative rods in vaginal fluid. Pap smear of vaginal scrapping is useful for diagnosis.
**Treatment:**
Conjugated Estrogen vaginal cream (Premarin Cream) 2-4 gms per day intravaginally or topically for 2-3 weeks then 1-2 gms 2 times per week. Consider oral hormone replacement therapy (estrogen/progesterone).

## Abnormal Uterine Bleeding

Menorrhagia, or excessive menstrual bleeding, is a complaint of 9-14% of healthy women.

Although menorrhagia is occasionally caused by potentially treatable diseases, such as thyroid dysfunction, infections or cancer, the excessive bleeding is most often idiopathic or related to anovulatory menstrual cycles. In the latter case, menorrhagia is referred to as dysfunctional uterine bleeding.

**I. Pathophysiology**

**A. Abnormal Bleeding** consists of bleeding that occurs at intervals of less than 21 days, or more than 36 days, lasting longer than 7 days, or blood loss greater than 80 mL.

**B.** A history of excessive menstrual bleeding (i.e., large volume, passage of clots and heavy use of tampons) is often a poor indicator of the actual amount of bleeding.

**C. Physiology of Normal Menstruation**

**1.** In response to gonadotropin-releasing hormone from the hypothalamus, the pituitary gland synthesizes follicle-stimulating hormone (FSH) and luteinizing hormone (LH) which induces the ovaries to produce estrogen and progesterone.

**2.** During the follicular phase estrogen stimulation causes an increase in endometrial thickness. After ovulation, the luteal phase begins, and progesterone causes endometrial maturation and secretory changes. If fertilization does not occur, estrogen and progesterone levels decline and menstruation occurs.

**3.** The normal menstrual interval is 21-35 days. Normal duration of menstrual flow is 2-6 days. Average blood loss per cycle is 20-60 mL.

**II. Clinical Evaluation of Abnormal Uterine Bleeding**

**A.** Obtain a menstrual and reproductive history, including last menstrual period, regularity, duration and frequency, number of pads per day, and postcoital or intermenstrual bleeding.

**B.** Evaluate for the presence of stress, exercise, weight changes, systemic diseases; particularly thyroid, renal, hepatic diseases, or coagulopathies. Consider the possibility of pregnancy, and determine the method of birth control.

**C. Determine whether the patient is having ovulatory or anovulatory cycles.**

**1.** Ovulatory cycles are characterized by menstrual flows occurring at regular intervals preceded by molimina changes (breast tenderness or fullness, cramping, edema).

**2.** If cycles are anovulatory, the patient has dysfunctional uterine bleeding. If bleeding occurs during ovulatory cycles, uterine pathology including uterine cancer, cervicitis, leiomyomas, endometriosis, and endometrial hyperplasia should be excluded.

**3.** Pathologic diagnoses are usually excluded, and the final diagnosis is likely to be dysfunctional uterine bleeding caused by anovulatory menstrual periods.

**D.** Endometrial biopsy is required for women older than 35 years old with persistent or recurrent menorrhagia or those who are in or near menopause.

**E.** Pregnancy complications, such as spontaneous abortion, ectopic pregnancy, placenta previa and abruptio placentae, can all cause heavy bleeding, although bleeding is usually not cyclic. Pregnancy should always be considered as a possible cause of abnormal uterine bleeding.

**F.** Hyperthyroidism and hypothyroidism, as well as other endocrine disorders, can sometimes cause menorrhagia. Additionally, bleeding disorders, such as immune thrombocytopenia, and anticoagulant use can lead to menorrhagia.

**III. Dysfunctional Uterine Bleeding**

**A.** Dysfunctional uterine bleeding is defined as abnormal uterine bleeding with no organic or anatomic cause.

**B.** DUB is synonymous with anovulatory bleeding. Most young, non-pregnant women with abnormal uterine bleeding are found to have dysfunctional uterine bleeding.

**C.** DUB occurs most often at the extremes of the reproductive years, after menarche and before menopause, when anovulatory cycles are common.

**D.** With chronic anovulation, extended episodes of copious bleeding are common, and these are separated by long intervals with no bleeding.

**IV. Management of Dysfunctional Uterine Bleeding**

**A.** Rule out pregnancy with a blood beta-HCG test or urine pregnancy test. A hemoglobin/hematocrit should be obtained if bleeding has been significant.

**B.** Long-term unopposed estrogen stimulation in anovulatory patients can result in endometrial hyperplasia, which can progress to adenocarcinoma.

**C.** In perimenopausal patients who have been anovulatory for an extended interval, the endometrium should be biopsied.

**D. Prostaglandin Inhibitors**

**1.** Nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit prostaglandins

in the endometrium, improve platelet aggregation, and increase uterine vasoconstriction in women with menorrhagia.

2. NSAIDs are the first choice in the treatment of menorrhagia, because they are generally well tolerated, associated with a low incidence of side effects, and they have no hormonal effects.
3. Women with menorrhagia frequently also have dysmenorrhea, and NSAIDs are the treatment of choice for this problem.
4. **Specific Agents**
   a. Mefenamic acid (Ponstel), 500 mg three times daily during the menstrual period. Mefenamic acid decreases menstrual blood loss by 30-50% per menstrual period.
   b. Naproxen (Anaprox, Naprosyn), 375 mg twice daily during the menstrual period.
   c. Meclofenamate sodium (Meclomen), 100 mg three times daily during the menstrual period.
   d. Ibuprofen (Motrin, Nuprin), 400 mg four times daily or 600 mg three times daily during the menstrual period.
   e. These agents appear to be equally effective in reducing menstrual blood loss.
   f. Gastrointestinal distress is common, and these agents are contraindicated in women with renal failure and peptic ulcer disease.

**E. Hormonal Therapy**

1. In women who do not desire immediate fertility, hormonal therapy may also be used to treat menorrhagia. Oral contraceptives are a well-tolerated, long-term treatment for women who do not want immediate fertility and who can tolerate side effects of these agents.
2. A 21-day package of oral contraceptives containing 35 mcg of estrogen (Ortho-Novum 1/30) is used. Have the patient take one pill three times a day for 7 days. During the 7 days of therapy, bleeding should subside and, following treatment, heavy flow will occur. After 7 days off the hormones, begin another 21-day package of oral contraceptives, taking one pill a day for 21 days followed by no pills for 7 days.
3. A cyclic regimen of medroxyprogesterone (Provera), 10-20 mg per day for days 16 through 25 of each month also results in reduction of menstrual blood loss.
   a. Women on this regimens must use some form of barrier contraception, since pregnancy is not prevented.
   b. Hormonal side effects, such as nausea and bloating, are common.

**F. Other Agents:** Ferrous sulfate 325 mg PO tid-qid and docusate (Colace) 100 mg PO bid.

**G. Surgical Treatment**

1. **Hysterectomy** is the most absolute curative treatment for menorrhagia.
2. **Dilatation and Curettage**: Dilatation and curettage has been used only as a temporizing measure in women with menorrhagia. Repeated procedures may cause Asherman's syndrome (intrauterine adhesions) and impaired fertility.
3. **Endometrial Ablation and Resection**
   a. Hysteroscopic endometrial ablation by laser, electrodiathermy "rollerball," or excisional resection have become more widely used and effective alternatives to hysterectomy.
   b. Endometrial ablation has less morbidity, shorter surgical times, and quicker recovery times than hysterectomy.

**V. Choice of Treatment**

**A.** Menorrhagia should usually be treated initially with NSAIDs. These drugs are inexpensive, and they only have to be taken during the menstrual period. NSAIDs are also very effective in treating concomitant dysmenorrhea.

**B.** In woman with metrorrhagia or very irregular periods who do not presently want sterilization, oral contraceptives should be used. Oral contraceptives usually decrease bleeding within 3 months. Long-term therapy may be needed.

**C.** For women who do not desire further pregnancies, who have significant anemia, and in whom medical treatment has failed, surgical treatment may be suggested.

# Breast Disorders

**I. Evaluation of Nipple Discharge**

**A.** Discharge may be a sign of cancer, and any nipple discharge must be evaluated. About 8% of biopsies performed for nipple discharge demonstrate cancer.

**B.** Determine the duration, bilaterality or unilaterality of the discharge and the presence of blood. Inquire about use of medications, including oral contraceptives, hormone preparations, and phenothiazines. A history of nipple or breast stimulation, and lactation experience should be determined.

**C.** Unilateral discharge, pink colored, bloody or nonmilky, discharge associated with a mass are the discharges of most concern.

**D.** Bilateral, milky discharges suggest an endocrine problem. Nipple discharge secondary to malignancy is more likely to occur in older patients.

**E.** The discharge should be tested for the presence of blood with standard Hemoccult cards. Nipple discharge secondary to carcinoma always contains hemoglobin.

**F. Heme-Negative Discharges**

**1.** A woman with a heme-negative discharge may be managed conservatively with a follow-up visit in 1-2 months. The discharge is unlikely to be caused by cancer.

**2.** Other etiologies should be investigated, and appropriate screening mammography should be done. A persistent, unilateral, heme-negative discharge should be pursued in the same fashion as a heme-positive discharge.

**G. Investigation of a Heme-Positive Discharge**

**1.** These patients require diagnostic mammography, followed by galactography by a radiologist to identify any potential areas for biopsy. During galactography discharging ducts are injected with contrast material; filling defects or blocked ducts suggest malignancy.

**2.** Even if the mammogram and the galactogram are negative for cancer, further evaluation is necessary. Patients with a heme-positive nipple discharge or a persistent unilateral heme-negative discharge should be evaluated by biopsy.

**3.** Cytologic examination of nipple discharges is not useful as a method of ruling out cancer.

## II. Evaluation of Breast Pain

**A.** Determine the duration and location of the pain, associated trauma, previous breast surgery, associated lumps or nipple discharge.

**B.** Pain is an uncommon presenting symptom for breast cancer; however, cancer must be ruled out. Cancer is the etiology in less than 5% of patients with breast pain. Pain that is associated with breast cancer is unilateral, intense, and constant.

**C. If no mass is present and the patient is less than 35 years of age**

**1.** It is unlikely that the pain is a symptom of cancer.

**2.** A follow-up clinical breast examination should be performed in 1-2 months. Diagnostic mammography is usually not helpful but may be considered.

**D. If the patient is 35 years of age or older**

**1.** Obtain diagnostic mammogram and ultrasound if the lesion is cystic.

**2.** If studies are negative, a follow-up examination in 1-2 months is appropriate.

**3.** If a suspicious lesion is detected, biopsy is required.

**E. Mastodynia**

**1.** Mastodynia is defined as breast pain in the absence of a mass or other pathologic abnormality.

**2. Causes of Mastodynia** include menstrually related pain, costochondritis, trauma, and sclerosing adenosis.

## III. Fibrocystic Complex

**A.** Changes are usually multifocal, bilateral and diffuse. One or more isolated fibrocystic lumps or areas of asymmetry may be present. The areas are usually tender.

**B.** This disorder predominantly occurs in women with premenstrual abnormalities, nulliparous women, and nonusers of oral contraceptives.

**C.** Usually begins in mid-20's or early 30's. Tenderness is associated with menses, and last about a week. The upper outer quadrant of the breast is most frequently involved (bilaterally).

**D.** There is no increased risk of cancer for the majority of patients.

**E.** Suspicious areas may be evaluated by fine needle aspiration (FNA) cytology or open biopsy. If mammography and FNA have been negative for cancer and clinical examination is benign, open biopsy is generally not needed.

**F.** The patient is often reassured by a negative mammogram to rule out cancer; however, the usefulness of a mammogram in young patients is minimal.

**G. Medical Management**

**1. Oral Contraceptives** are effective for severe breast pain in most young women. Start with a pill that contains low amounts of estrogen and relatively high amounts of progesterone.

**2. For Patients Refractory to Therapy with Oral Contraceptives,** add medroxyprogesterone 5-10 mg per day from days 15-25 of each cycle.

**3. Other Measures:**

**a.** A professionally fitted support bra often provides significant relief.

**b.** Dietary Changes: A Low fat, no methylxanthines diet, vitamins (E and B complex), evening primrose oil, and stopping smoking may provide relief.

**c.** NSAIDs and bromocriptine have been used.

# Evaluation of Breast Masses

**I. Guidelines for Breast Cancer Screening**

**A. Women 20 years and older**: Monthly breast self examination.

**B. Ages 40-49**: Annual clinical examinations by physician and screening mammography at 2-3 year intervals.

**C. Age 50 and older**: Clinical examination and mammography annually.

**D.** Women with a personal history of breast cancer, history of breast cancer in a mother or sister, or with other risk factors, require closer surveillance.

**II. Clinical Evaluation of Breast Masses**

**A.** A detailed history should determine the presence of associated pain (especially if cyclical), nipple discharge, duration of mass, change in size, and color of any nipple discharges.

**B.** Determine patient age and menopausal status. The incidence of breast cancer rises rapidly in the fifth decade. Breast cysts are common before menopause and vary in size with menses.

**C.** Determine results of and time since the last clinical breast examination and the last mammogram. Assess breast self-examination practices and previous breast masses and biopsies.

**D. Risk Factors for Breast Cancer:**

1. Female sex
2. Age over 50 years old
3. Previous breast cancer
4. Family history, particularly in first degree, maternal, or premenopausal relatives.

**E.** 80% of women with breast cancer have no risk factors other than being women and over 50 years old.

**F. Physical Examination**

1. First examine the patient in the supine position with her arms up and behind her head. This flattens the breast tissue and compresses it for examination.
2. Then have the patient sit up with arms first at her side and then behind her head. This facilitates examination of the breast contours and allows visualization of nipple inversion or tethering.
3. Examine for dimpling, asymmetry, lumps, thickened areas, changes in shape or contour. Carefully palpate both breasts and the axillae. Compress nipples to identify any discharge. Make a drawing of any irregularities and masses.
4. The characteristics of a lump have limited diagnostic value. Very discrete, smooth nodules are more likely to be benign; tenderness is usually associated with benignity. If the physical characteristics of the mass suggest benignity, it is reasonable to monitor a nodule during one menstrual cycle.
5. Assess mass for singular or multiple components, mobility, tenderness, and cystic or solid qualities.

**III. Differential Diagnosis by Age of the Patient**

**A. <30 Years Old:** The common causes are fibroadenoma, papillomatosis,

abscess (especially if lactating), or fat necrosis.

**B. 30-50 Years Old:** Consider fibrocystic mastopathy, cancer, fat necrosis, or cystosarcoma phylloides.

**C. If Older than 50:** Cancer is the primary diagnosis, followed by fibrocystic mastopathy, fat necrosis, and cyst.

## IV. Diagnostic Approach to a Breast Mass

**A.** The goal of breast cancer screening is early identification of dominant breast masses or mammographic abnormalities (masses or microcalcifications). A dominant breast mass is a palpable breast lesion that is distinct from the surrounding breast nodularity, persistent through at least 2-3 menstrual cycles (if the patient is pre-menopausal), and is relatively unchanging. Although they generally represent benign processes, it is essential that they be worked-up to exclude malignancy.

**B.** Mammographic abnormalities, such as masses, irregularities, asymmetry, and new suspicious microcalcifications demand biopsy for diagnosis.

**C.** Once a dominant mass has been identified, an ultrasound of the breast should be obtained to determine if the mass is cystic or solid. If the lesion is cystic, the fluid can be removed and the cyst collapsed. If the mass is solid, some form of tissue biopsy is required.

**D. Cyst Aspiration:** If physical characteristics support the diagnosis of a cyst, needle aspiration should be done.

1. Swab the area of the breast with Betadine, and inject 1% lidocaine into the overlying skin using a 27-30 gauge needle.
2. Insert a 22 gauge needle into the mass and evacuate the cyst.
3. Non-bloody fluid should not be sent for cytology. If grossly bloody, the fluid should be analyzed by cytology, and biopsy considered. A compression dressing is placed over the breast, and the patient reexamined in 3-4 weeks.
4. If the lesion is found to be solid or if no fluid is obtained, use the 22 gauge needle to aspirate tissue (fine needle aspiration cytology).
5. If non-bloody fluid was removed, the patient can then be observed for recurrence.
6. Recurrence of cyst, or residual mass after aspiration, or presence of bloody aspirate requires further evaluation by ultrasound and/or biopsy.

**E. Fine-Needle Aspiration Cytology**

1. Sensitivity 65-98%. False-positive results are rare, but false-negative rates may be as high as 22%. If fine-needle aspiration is negative, biopsy is required.
2. Use a 10- or 20-mL syringe with a 22 gauge needle. When the needle enters the mass, apply suction by retracting the plunger and advance the needle. Direct the needle to different areas of the mass, maintaining suction on the syringe.
3. Slowly release suction before the needle is withdrawn from the mass., and place the contents of the needle onto glass slides or put the cells in a fixative solution for pathologic examination.

## V. Nonpalpable (occult) Breast Lesions Detected by Mammogram

**A. Evaluate with Breast Ultrasound**

1. **If Solid:** The lesion should be localized by mammographic placement of a wire, followed by open, wire-localization biopsy.
2. **If Cystic:** Cyst aspiration may be considered as above, or follow the mass with breast self exam, ultrasound, clinical exam, and mammogra-

phy. If the lesion becomes solid, evaluate with biopsy or aspiration cytology. If it remains cystic, continue follow-up examinations.

## VI. Important Diagnostic Caveats

**A.** A normal mammogram is meaningless in the presence of a mass, and a mammogram can not rule out cancer.

**B.** Mammography will miss 15-20% of breast cancers found on clinical examination. False-negative mammograms have been found in up to 63% of women younger than age 45.

**C.** The majority of mammographic abnormalities and especially breast masses are benign (approaching 90+ percent in some series).

**D.** Assure a follow-up examination for all patients, even if there is absolute certainty that the mass is insignificant or benign.

**E.** A breast mass in a pregnant patient warrants the same timely evaluation as in a non-pregnant patient.

**F.** Routine use of mammography in women less than 35 years old is usually unrewarding and potentially misleading and dangerous. Dense, hormonally active breast tissue in this group makes interpretation difficult and can not reliably define malignancy.

# *Infectious Diseases*

## Urinary Tract Infection

**I. Clinical Evaluation**

**A. Acute Uncomplicated Upper Tract Infection** is associated with Dysuria, urgency, and frequency without fever or back pain. Most common in women in their childbearing years. Internal dysuria indicates bladder infection, external dysuria indicates vaginitis.

**B. Acute Pyelonephritis** is associated with fever and costovertebral angle pain and tenderness with frequency, urgency, and dysuria. Leukocytosis is often present; urinalysis reveals pyuria and bacteriuria. White blood cell and bacterial casts confirm parenchymal invasion. Blood cultures may be useful, particularly in older patients.

**II. Pathogenesis of Urinary Tract Infection**

**A.** Enterobacteriaceae are the bacteria most often responsible. Escherichia coli causes 80% of urinary tract infections. Staphylococcus saprophyticus (Gram-positive, coagulase-negative) is the second most common, particularly in young women; the diagnosis is often missed due to low urine colony counts and negative nitrite screening.

**B.** Chlamydia trachomatis infection may cause dysuria, urgency, frequency, pyuria, and sterile bacterial cultures; diagnosed by cell culture or monoclonal antibody techniques of cellular material from urethral or cervical exudate. It is a major sexually transmitted cause of prostatitis, epididymitis, and nongonococcal urethritis in men under age 40.

**C. Risk Factors for Urinary Tract Infection**: Diaphragm or spermicide use (alters vaginal pH), sexual intercourse, elderly, acquired anatomic abnormality, calculi, gynecologic abnormalities, prostatic obstruction, confinement in bed, urinary tract instrumentation.

**III. Laboratory Evaluation**

**A.** Microscopic pyuria is a nonspecific indicator of inflammation; bacteriuria confirms the diagnosis. Bacteria on microscopic examination of unspun urine correlates well with UTI.

**B.** Positive nitrite reading on reagent stick examination is useful, but false-negatives occur. False-negative and false-positives may also be seen with leukocyte esterase.

**C.** Culture and sensitivity testing is indicated if there is failure to respond to therapy, suspected acute pyelonephritis, or complicated infections (calculi, obstruction, diabetes, immunosuppression).

**D.** Follow-up post treatment culture is indicated in pyelonephritis or complicated infections. Recurrence or persistence of the same organism indicates a residual focus of infection that may respond to long-term (4-6-week) therapy.

**IV. Treatment of Acute Lower Urinary Tract Infection**

**A. Acute uncomplicated urinary tract infections** can be effectively and inexpensively treated with oral trimethoprim-sulfamethoxazole. A good alternative would be a fluoroquinolone. Other alternatives include an oral

cephalosporin or amoxicillin, but many urinary pathogens are resistant to amoxicillin.

**B. Complicated urinary tract infections** that occur repeatedly after the use of antimicrobial agents or that are acquired in hospitals or nursing homes are more likely to be due to antibiotic-resistant gram-negative bacilli. In more severely ill patients hospitalized with urinary tract infections, treatment with a third-generation cephalosporin, ticarcillin/clavulanic acid, piperacillin/tazobactam or imipenem is recommended, sometimes together with an aminoglycoside, especially if urosepsis is present.

**C. A 3-day course** is now recommended because of greater initial success in eliminating infection. A 7 day course is indicated if diabetes, symptoms >7 days, or elderly.

Trimethoprim-sulfamethoxazole (Septra) 1 double strength tab (160/800 mg) PO bid
Norfloxacin (Noroxin) 400 mg PO bid
Ciprofloxacin (Cipro) 250 mg PO bid
Ofloxacin (Floxin) 400 mg PO bid
Lomefloxacin (Maxaquin) 400 mg PO qd
Enoxacin (Penetrex) 200-400 mg PO q12h; 1h before or 2h after meals
Cefadroxil (Duricef) 500 mg PO bid
Cephalothin (Keflex) 500 mg PO q6h
Cefixime (Suprax) 200 mg PO q12h or 400 mg PO qd
Cefazolin (Ancef) 1-2 gm IV q8h.
Nitrofurantoin (Macrodantin) 100 mg PO qid or Macrobid 100 mg PO bid
Amoxicillin/clavulanate (Augmentin) 250 mg PO tid
Amoxicillin 500 mg PO tid

**D. Urinary Analgesia**

Phenazopyridine (Pyridium) 100 mg PO tid [100 mg]

## V. Treatment of Acute Pyelonephritis

**A.** Parenteral antibiotics are usually indicated in older patients, coexistent illness (diabetes, heart disease), or for ill appearing patients.

**B. Otherwise healthy, patients with uncomplicated pyelonephritis without signs of sepsis** can be effectively and inexpensively treated with oral trimethoprim-sulfamethoxazole. A good alternative would be an oral fluoroquinolone or an oral cephalosporin.

**C.** Pyelonephritis that occurs repeatedly after the use of antimicrobial agents or that is acquired in hospitals or nursing homes is more likely to be due to antibiotic-resistant gram-negative bacilli. In more severely ill patients, treatment with an IV third-generation cephalosporin, ticarcillin/clavulanic acid, piperacillin/tazobactam or imipenem is recommended, sometimes together with an aminoglycoside, especially if urosepsis is present.

**D.** Coverage should include gram-negative organisms and enterococci. E coli resistance to ampicillin and trimethoprim/sulfamethoxazole is increasing.

**E. Antibiotic Therapy for Acute Pyelonephritis**

Trimethoprim-sulfamethoxazole (Septra) 1 double strength tab (160/800 mg) PO bid or 10 mLs in 100 mLs D5W IV over two hours q12h
Ciprofloxacin (Cipro) 250-500 mg PO bid or 200-400 mg IV q12h
Norfloxacin (Noroxin) 400 mg PO bid
Ofloxacin (Floxin) 400 mg PO or IV bid
Lomefloxacin (Maxaquin) 400 mg PO qd
Enoxacin (Penetrex) 200-400 mg PO q12h; 1h before or 2h after meals
Cefadroxil (Duricef) 500 mg PO bid
Nitrofurantoin (Macrodantin) 100 mg PO qid or Macrobid 100 mg PO bid

Amoxicillin 500 mg PO tid
Amoxicillin/clavulanate (Augmentin) 500 mg tab PO tid
Ceftizoxime (Cefizox) 1 gm IV q8h
Ceftazidime (Fortaz) 1 gm IV q8h
Ceftriaxone (Rocephin) 0.5-1 gm IV q12h
Ticarcillin/clavulanate (Timentin) 3.1 gm IV q6h
Piperacillin/tazobactam (Zosyn) 3.375-4.5 gm IV/PB q6h
Imipenem/cilastatin (Primaxin) 0.5-1.0 gm IV q6-8h.
Gentamicin or tobramycin - loading dose of 100-120 mg IV (1.5-2 mg/kg); then 80 mg IV q8h (2-5 mg/kg/d).
Ampicillin 1 gm IV q4-6h

**F.** Parenteral therapy should be continued for 24 hours after afebrile; oral agents should be taken to complete a 10-14 day course. If fever does not respond within 72 hours, an underlying factor should be suspected. Imaging studies should be obtained to exclude obstruction, calculi, or abscesses.

**VI. Recurrent Urinary Tract Infections**

**A.** If recurrent UTI's occur, use of a diaphragm and spermicide should be discontinued. Postcoital voiding and long-term, single-dose, antimicrobial therapy may be used.

**B. Long-term Suppressive Therapy:** Trimethoprim/sulfamethoxazole (Bactrim, Septra), one-half of single-strength tablet 3 times weekly.

**C.** Self administration of single-dose or short-term antibiotic such as trimethoprim/sulfamethoxazole may be prescribed.

**VII. Urinary Tract Infections in Men**

**A.** Etiologic agents are the same as for women, and the same antibiotics may be used.

**B.** Antibiotics should be administered for a prolonged, 7-14 day course. Obtain a pretreatment culture.

**VIII. Indwelling Catheters**

**A.** Antibiotic prophylaxis is not recommended while the catheter is in place; antibiotics should be reserved for symptomatic infection or other evidence of sepsis.

**B.** Bacteriuria that is acquired after short-term catheter use should be treated.

# Pubic Infections

**I. Human Papilloma Virus**

**A.** HPV is the most common tumor of the vulva. The incubation period for this virus varies from weeks to months.

**B. Clinical Evaluation**

**1.** Lesions, referred to as condyloma acuminata, are characterized by rough, verrucous papillomas on the genitalia.

**2.** Secondary pyogenic infections can occur, and there is often a concomitant vaginitis.

**3.** Enlargement often occurs during pregnancy. Sometimes lesions disappear spontaneously.

**4.** Large lesions or lesions in elderly women may need biopsy.

**5.** No practical screening tests for subclinical infection exist--

Acetowhitening is not a specific test. Pap smear diagnosis of HPV generally does not correlate well with detection of HPV DNA in cervical cells.

**C. Treatment of Genital/Perianal Warts**

1. **Cryosurgery with liquid nitrogen or cryoprobe** is more effective than topical therapies. Lesions should be frozen until a 2 mm margin of freeze appears, then allow the lesion to thaw, then refreeze. Repeat freeze several times.
2. **Podophyllin** 25% in compound tincture of benzoin may be applied and washed off 4 hours later; 2 or 3 applications 1 week apart may be needed. Do not use podophyllin on the vagina or cervix; contraindicated in pregnancy.
3. **Trichloracetic acid** (80%): Apply to lesion with a cotton-tip applicator, then observe for 5-10 minutes, may need 2 or 3 applications, 1 week apart. Burning is common, and soda bicarbonate should be kept available to neutralize the acid if necessary. These acids work best on the cervix and on the vaginal sidewalls but can also be used for external cutaneous warts; can be used during pregnancy.
4. **Podofilox 0.5% (Condylox)** solution for self-treatment: Apply twice daily for 3 days followed by 4 days of no therapy. This cycle may be repeated as necessary for a total of 4 cycles; not for use on vagina or cervix; contraindicated in pregnancy.
5. **Surgical excision and electrocoagulation** of the base or laser may be used.
6. **Large, Bulky or Extensive Lesions**
   - **a.** General anesthesia and wire loop cautery may be used.
   - **b.** Topical 5-FU cream may eradicate the lesions or reduce their size. Topical 5-fluorouracil cream in a 1-2% concentration has been effective in the treatment of vaginal condylomata; contraindicated in pregnancy.
7. Recurrence rates are high (25% within 3 months) with all modalities. Recurrences of genital warts more commonly result from reactivation of subclinical infection than reinfection. No therapy has been proven to eradicate HPV.

**D. Partner Referral**

1. Examination is not recommended, but counseling may be of benefit.
2. Annual Pap smears are recommended independent of wart history.
3. The use of condoms may reduce transmission to partners.
4. The period of communicability is prolonged.

## II. Molluscum Contagiosum

**A.** This disease is produced by a virus of the pox virus family, and is spread by sexual or close personal contact.

**B. Clinical Features:** These lesions are asymptomatic and easily overlooked; usually multiple and far apart with a central umbilication. The lesions can be spread by autoinoculation. Lesions last from 6 months to many years.

**C. Diagnosis:** The characteristic appearance usually is adequate for diagnosis, but may be confirmed by biopsy. Both methods show intracytoplasmic inclusions.

**D. Treatment:** Lesions should be removed by sharp dermal curette, cryosurgery with liquid nitrogen, or by electrodesiccation.

**III. Pediculosis Pubis (Crabs)**

**A. Clinical Features**

1. Phthirus pubis is a blood sucking louse that is unable to survive more than 24 hours off the body.
2. The louse is often transmitted sexually and is principally found on the pubic hairs.
3. Severe itching, may lead to excoriations and secondary bacterial infection.
4. In long-standing cases, nonblanching, blue-gray macules, averaging 0.5-1.0 cm, may appear on the abdomen and flanks.
5. **Diagnosis** is made by locating nits or adult lice on the hair shafts.

**B. Treatment**

1. 5% Permethrin cream (Elimite) is the most effective treatment, and it should be applied for 10 minutes and washed off.
2. Kwell shampoo, lathered for at least 4 minutes, can be used (not for pregnant or lactating women).
3. All contaminated clothing and linen should be laundered or sprayed; they will become self-sterilized if not worn or used for 2 weeks.

**IV. Pubic Scabies**

**A.** This highly contagious infestation is caused by the Sarcoptes scabiei, which varies in length from 0.2-0.4 mm.

**B.** Transmitted by intimate contact or by infested clothing.

**C. Clinical Features**

1. The female mite burrows into the skin, and after 1 month, severe pruritus develops
2. A multiform eruption may be characterized by papules, vesicles, pustules, urticarial wheals, and secondary infections occurring on the hands, wrists, elbows, belt line, buttocks, genitalia, and outer borders of the feet.

**D. Diagnosis** is confirmed by visualization of burrows and observing the parasites, eggs, larvae, or red fecal compactions under low power microscopy.

**E. Treatment**

1. Kwell cream or lotion is applied to the total body from the neck down for 8-12 hours (not for pregnant or lactating women).
2. In infants, children under 10, pregnant and lactating women, crotamiton 10% (Eurax) is applied to the entire body from the neck down nightly for 2 nights and wash off thoroughly 24 hours after the second application.

# Sexually Transmitted Diseases

**I. Gonorrhea**

**A. Recommended Treatment of Uncomplicated Infections**

1. Ceftriaxone (Rocephin) 250 mg IM; active against incubating syphilis.
2. Cefixime (Suprax) 400 mg po; active against incubating syphilis.
3. Ciprofloxacin (Cipro) 500 mg po; contraindicated <17 years of age; not active against syphilis.
4. Ofloxacin (Floxin) 400 mg po; contraindicated <17 years of age; not active against syphilis.

**plus**

5. Doxycycline 100 mg po bid x 7 days for coexisting C. trachomatis infection; may abort incubating syphilis.

**B. Alternative Regimens**

1. Ceftizoxime 500 mg IM, Cefotaxime 500 mg IM, Cefotetan 1 g IM, Cefoxitin 2 g IM, Cefuroxime axetil (Ceftin) 1 g po, Cefpodoxime 200 mg po.
2. Enoxacin 400 mg po, Lomefloxacin 400 mg po, or Norfloxacin 800 mg po.

**plus**

3. Doxycycline 100 mg po bid x 7d.

**C. Indications for Immediate Empiric Treatment**

1. Mucopurulent cervicitis
2. Pelvic inflammatory disease
3. Contacts to GC or to presumptive GC infection
4. Treatment of partners should be provided

**D. Diagnostic Labs**

1. Culture is recommended for public health purposes.
2. Test of cure is not necessary.
3. Consider serologic testing for syphilis and HIV.

## II. Chlamydia Trachomatis

**A. Recommended Treatment of Uncomplicated Infections**

1. Doxycycline 100 mg po bid x 7d
2. Azithromycin (Zithromax) 1 g po x 1 dose

**B. Alternative Regimens**

1. Ofloxacin (Floxin) 300 mg po bid x 7 d
2. Erythromycin base 500 mg po qid x 7 d; not as efficacious as doxycycline; useful in pregnancy
3. Test of cure should be considered if alternative regimens are used.

**C. Diagnostic Labs**

1. Culture and nonculture techniques for chlamydia are available.
2. Test of cure is not necessary if a recommended regimen was used.
3. Consider serologic testing for syphilis and HIV.

## III. Nongonococcal Urethritis

**A. Diagnosis**

1. Symptoms include dysuria, discharge
2. Testing to determine specific diagnosis is recommended
   a. Gram stain of intraurethral swab specimen or visible discharge may demonstrate more than 5 WBC per oil immersion field.
   b. Leukocyte esterase test of 1+ or greater on first 15 mL of voided urine may be found.

**B. Treatment of Uncomplicated Infections**

1. **Recommended Regimens**
   a. Doxycycline 100 mg po bid x 7 d
   b. Azithromycin (Zithromax) 1 g po x 1 dose
2. **Alternative Regimens:** Erythromycin base 500 mg po qid x 7 d or erythromycin base 250 mg po qid x 14 d
3. Sexual contacts should be treated.

# Pelvic Inflammatory Disease

## I. Epidemiology

**A.** It is estimated that one in 10 women has PID during her reproductive years. At least one-fourth of women with PID have serious sequelae, such as infertility, ectopic pregnancy or chronic pelvic pain, and they are at risk for major abdominal surgeries such as tubo-ovarian abscess drainage or lysis of pelvic adhesions.

**B.** Pelvic inflammatory disease (PID) includes any combination of endometritis, salpingitis, tubo-ovarian abscess and pelvic peritonitis.

**C.** Significant risk factors include multiple sex partners, frequent sexual intercourse and the acquisition of new sexual partners within the previous 30 days.

## II. Microbiology and Pathophysiology

**A.** PID is usually polymicrobial and includes both aerobic and nonaerobic bacteria.

**B.** Sexually transmissible organisms most frequently implicated in PID include Neisseria gonorrhoeae, Chlamydia trachomatis, and genital Mycoplasma.

**C.** Anaerobic bacteria implicated in PID include Peptococcus species, Peptostreptococcus species, and Bacteroides species.

**D.** Facultative aerobes involved with PID include Escherichia coli, group B streptococcus, Gardnerella vaginalis, and Haemophilus influenzae.

## III. Diagnosis

**A.** The diagnosis of PID relies on a high index of suspicion, coupled with empiric antibiotics, initiated before culture results are obtained.

**B.** PID is correctly diagnosed on the basis of clinical and laboratory indicators in only 65% of cases. Therefore, a high index of suspicion for diagnosis of PID should be maintained, with a low threshold for initiating empiric antibiotics.

**C.** The diffuse lower abdominal pain of PID is often dull and constant, usually bilateral, and less than 2 weeks in duration. Sexual history may include multiple partners and exposure to sexually transmitted disease.

**D.** An abnormal vaginal discharge, abnormal bleeding, dysuria, dyspareunia, nausea, vomiting, or fever may be present. PID is more likely to begin during the first half of the menstrual cycle after menses.

**E.** Abdominal pain, adnexal tenderness and cervical motion tenderness are the most frequently observed clinical findings in PID. Adnexal tenderness may be unilateral in 20% of cases.

**F.** For patients with symptoms, demonstration of lower abdominal tenderness, adnexal tenderness and cervical motion tenderness is sufficient evidence for beginning empiric therapy for suspected PID, provided that competing diagnoses are adequately excluded.

**G. Differential Diagnosis for PID**

| | |
|---|---|
| Appendicitis | Irritable bowel syndrome |
| Ectopic pregnancy | Somatization |
| Hemorrhagic ovarian cyst | Gastroenteritis |
| Ovarian torsion | Cholecystitis |
| Endometriosis | Nephrolithiasis |

## IV. Laboratory Evaluation

**A.** Laboratory studies may be entirely normal. An elevated leukocyte count does not appear to distinguish PID from competing diagnoses.

**B.** Cervical cultures for gonorrhea or Chlamydia require 3-7 days for results.

**C.** Despite the good specificity of nonculture tests (e.g., Chlamydiazyme, Sure Cell Chlamydia), sensitivity remains less than optimal.

**D.** Human immunodeficiency virus (HIV) and syphilis testing should be recommended for patients with suspected cervical gonorrhea, Chlamydia, or PID.

**E.** Pelvic ultrasonography can detect pelvic abscesses.

**F.** Laparoscopy is the "gold standard" of PID, and it is recommended when the diagnosis is unclear or when the patient fails to improve. Laparoscopy also detects ovarian cysts, ectopic pregnancy, appendicitis, or endometriosis.

## V. Treatment and Supportive Care

**A.** **Antibiotic Therapy** should be initiated as soon as the diagnosis of PID is suspected, usually before culture results are available.

**B.** The CDC guidelines for outpatient management of PID offer two regimens. Regimen A includes the intramuscular injection of a cephalosporin plus oral doxycycline (Vibramycin). Regimen B combines oral ofloxacin (Floxin), with oral metronidazole (Flagyl). The latter combination not only covers gonorrhea and Chlamydia effectively, but also provides excellent anaerobic coverage.

**C.** **Outpatient Treatment of PID**

1. **Regimen A**
   - **a.** Ceftriaxone (Rocephin), 250 mg intramuscularly (or other parenteral third-generation cephalosporin), or Cefoxitin (Mefoxin), 2 g intramuscularly plus probenecid (Benemid), 1 g orally in a single dose
     Plus
   - **b.** Doxycycline (Vibramycin), 100 mg orally two times a day for 14 days
2. **Regimen B**
   - **a.** Ofloxacin (Floxin), 400 mg orally two times a day for 14 days
     Plus
   - **b.** Clindamycin (Cleocin), 450 mg orally four times a day, or metronidazole (Flagyl), 500 mg orally two times a day, for 14 days

**D.** **Inpatient Treatment of PID**

1. **Regimen A**
   - **a.** Cefoxitin (Mefoxin), 2 g intravenously every 6 hours, or cefotetan (Cefotan), 2 g intravenously q12h
     Plus
   - **b.** Doxycycline (Vibramycin), 100 mg IV or PO bid
2. **Regimen B**
   - **a.** Clindamycin (Cleocin), 900 mg IV q 8 hours
     Plus
   - **b.** Gentamicin (Garamycin), loading dose intravenously or intramuscularly (2 mg/kg), followed by a maintenance dose (1.5 mg per kg) every 8 hours
3. Intravenous therapy should be continued for at least 48 hours after clinical improvement, followed with doxycycline, 100 mg orally two times a day, for a total of 14 days. If tubo-ovarian abscess is present, clindamycin is used for continued therapy, rather than doxycycline.
4. Regimen A is superior if Chlamydia is suspected as being a primary pathogen.
5. Regimen B has the advantage when highly effective anaerobic coverage

is desired, such as in patients with suspected tubo-ovarian or pelvic abscesses.

6. Adequate hydration and analgesia should also be provided.
7. **Partner Referral:** Sexual contacts should be treated for GC and Chlamydia without regard to clinical or laboratory results.

**VI. Sequelae of Pelvic Inflammatory Disease** Long-term effects of PID include recurrent infection, tubo-ovarian abscess formation, chronic abdominal pain, infertility and ectopic pregnancy.

# Syphilis

**I. Clinical Evaluation**

**A. Primary Syphilis:**

1. The incubation period for syphilis is 10-90 days; 21 is average.
2. Begins as a painless, solitary nodule that becomes an indurated ulceration (chancre) with a ham-colored, eroded surface, and a serous discharge. 95% of primary lesions are found on or near the genitalia. Atypical lesions are frequent and may take the form of small multiple lesions.
3. Usually accompanied by painless, enlarged regional lymph nodes.
4. Untreated lesions heal in 1-5 weeks.
5. The diagnosis is made by the clinical appearance and a positive darkfield examination; the serologic test (VDRL, RPR) is often negative in early disease.

**B. Secondary Syphilis:**

1. 25% of untreated patients progress to secondary syphilis 2-6 months after exposure, and secondary syphilis lasts 4-6 weeks.
2. Bilateral, symmetrical, macular, papular, or papulosquamous skin lesions are widespread and non-pruritic, and frequently involve the palms, soles, and face, in addition to the trunk and extremities. Condyloma lata consists of rash and moist lesions. Secondary syphilis is highly infectious.
3. Mucous membranes are often involved; white patches in the mouth, nose, vagina, rectum.
4. Generalized nontender lymphadenopathy. Patchy alopecia sometimes occurs. A small percentage have iritis, hepatitis, meningitis, fever, and headache.
5. The serologic test (VDRL. RPR) is positive in >99 % of cases; the test may be falsely negative because of the prozone phenomenon caused by high antigen titers. Retesting of a diluted blood sample may be positive. No culture test is available.

**C. Latent Syphilis** consists of the interval between secondary syphilis and late syphilis. Patients have no signs or symptoms, only positive serological tests.

**D. Late Syphilis:** Characterized by destruction of tissue, organs, and organ systems.

1. **Late Benign Syphilis:** Gummas occur in skin or bone and do not result in severe incapacity or death.
2. **Cardiovascular Syphilis:** Medial necrosis of the aorta with dilation of the ascending aorta may lead to aortic insufficiency or saccular

aneurysms of the thoracic aorta.

3. **Neurosyphilis:**
   - **a.** Spinal fluid shows elevated WBCs, increased total protein, and positive serology.
   - **b.** Pupillary changes are common; Argyll Robertson pupil accommodates but does not react to light.
   - **c.** Can result in general paresis or tabes dorsalis--degeneration of the ascending sensory neurons in the posterior columns of the spinal cord.

**II. Serology**

**A. Nontreponemal Tests**:

1. Complement fixation tests (VDRL or RPR) are used for screening; become positive 4-6 weeks after infection. They start in low titer and, over several weeks, may reach 1:32 or higher. After adequate treatment of primary syphilis, the titer falls and, in most cases, is nonreactive within 9-18 months.
2. False positive tests occur in hepatitis, mononucleosis, viral pneumonia, malaria, varicella, autoimmune diseases, diseases associated with increased globulins, narcotic addicts, leprosy, or old age.

**B. Treponemal Tests:**

1. Treponemal tests include the FTA-ABS test, TPI test, and microhemagglutination assay for T. pallidum (MHA-TP). A treponemal test should be used to confirm a positive VDRL or RPR.
2. Treponemal tests are specific to treponema antibodies, and will remain positive after treatment.

**C.** All patients with syphilis should be tested for HIV.

**III. Treatment of Primary or Secondary Syphilis**

**A. Nonallergic Patients with Primary or Secondary Syphilis:** Benzathine penicillin G, 2.4 million units IM in a single dose.

**B.** Treatment of HIV infected patients with syphilis requires consultation with a specialist.

**C.** Patients who have syphilis, and who also have symptoms or signs suggesting neurologic disease (meningitis) or ophthalmic disease (uveitis), should be fully evaluated for neurosyphilis and syphilitic eye disease (CSF analysis and ocular slit-lamp examination).

**D.** Unless clinical signs or symptoms of neurologic involvement are present (auditory, cranial nerve, meningeal, or ophthalmic manifestations), lumbar puncture is not recommended for routine evaluation of primary or secondary syphilis.

**E. Penicillin Allergic Patients:** Doxycycline 100 mg orally 2 times a day for 2 weeks or Tetracycline 500 mg orally 4 times a day for 2 weeks contraindicated in pregnancy.

**F. Follow-Up and Retreatment:**

1. Early syphilis--repeat VDRL at 3, 6, and 12 months; ensure that titers are declining.
2. Syphilis >1 year--also repeat VDRL at 24 months.
3. Neurosyphilis-- also repeat VDRL for 3 years.
4. **Indications for Retreatment:**
   - **a.** Clinical signs or symptoms persist or recur.
   - **b.** 4-fold increase in the titer of a nontreponemal test (VDRL).
   - **c.** Failure of an initially high titer nontreponemal test (VDRL) to show a

5. Sex Partners should be evaluated and treated.

## IV. Treatment of Latent Syphilis

**A.** Patients who have latent syphilis who have acquired syphilis within the preceding year are classified as having early latent syphilis. Nearly all others have latent syphilis of unknown duration and should be managed as late latent syphilis.

**B.** These treatment regimens are for nonallergic patients with normal CSF examination (if performed).

**C. Treatment of Early Latent Syphilis:** Benzathine penicillin G, 2.4 million units IM in a single dose.

**D. Treatment of Late Latent Syphilis or Latent Syphilis of Unknown Duration:** Benzathine penicillin G, 7.2 million units total, administered as 3 doses of 2.4 million units IM each, at 1-week intervals.

**E.** All patients should be evaluated clinically for evidence of late (tertiary) syphilis (aortitis, neurosyphilis, gumma, iritis). The recommended therapy for patients with latent syphilis is not optimal for persons with late syphilis or asymptomatic neurosyphilis.

**F. Indications for CSF Examination Before Treatment:**

1. Neurologic or ophthalmic signs or symptoms
2. Other evidence of active syphilis (aortitis, gumma, iritis)
3. Treatment failure
4. HIV infection
5. Serum nontreponemal titer >1:32, unless duration of infection is known to be <1 year
6. Nonpenicillin therapy planned, unless duration of infection is known to be <1 year.

**G.** **CSF Examination** includes cell count, protein, and CSF-VDRL. CSF examination may be completed for persons who do not meet the criteria listed above. If a CSF examination is performed and the results are abnormal, the patient should be treated for neurosyphilis.

## V. Treatment of Late Syphilis

**A.** Benzathine penicillin G, 7.2 million units total, administered as 3 doses of 2.4 million units IM, at 1-week intervals.

**B.** Patients with late syphilis should undergo CSF examination before therapy. Infectious disease consultation is recommended.

## VI. Treatment of Neurosyphilis

**A.** Central nervous system disease can occur during any stage of syphilis. Clinical evidence of neurologic involvement (e.g., ophthalmic or auditory symptoms, cranial nerve palsies) warrants a CSF examination. Syphilitic eye disease should be treated as neurosyphilis.

**B.** Patients with CSF abnormalities should have follow-up CSF examinations to assess response to treatment.

**C. Treatment of Neurosyphilis:** 12-24 million units aqueous crystalline penicillin G daily, administered as 2-4 million units IV every 4 hours, for 10-14 days.

**D. Follow-Up:** If CSF pleocytosis was present initially, CSF examination should be repeated every 6 months until the cell count is normal. Follow-up CSF examinations also may be used to evaluate changes in the VDRL-CSF or CSF protein in response to therapy.

# Vaginal Infections

**I. Clinical Evaluation of Vaginal Symptoms**

**A.** Determine type and extent of symptoms, such as internal or external itching, discharge, odor, or pelvic pain.

**B.** Change in sexual partners or sexual activity, recent changes in contraception method, medications (antibiotics, contraceptives), and history of prior genital infections in patient or partner should be noted.

**C.** Use of nonprescription products, douching, new soaps, or deodorant sprays should be determined.

**D.** Possibility of pregnancy should be assessed.

**E. Physical Examination**

**1.** Examine for erythema, swelling, or lesions on the perineum, vulva, vagina or cervix.

**2.** Note the color, texture, and odor of vaginal or cervical discharge.

**3. Saline Wet Mount**

**a.** Use one swab to obtain a sample from the posterior vaginal fornix, obtaining a "clump" of discharge if possible. Place the sample on a slide, add one drop of normal saline, and apply a coverslip.

**b.** Coccoid bacteria and clue cells (bacteria-coated, stippled, epithelial cells) are characteristic of bacterial vaginosis.

**c.** Trichomoniasis is confirmed by identification of trichomonads--motile oval flagellates. White blood cells are usually prevalent.

**4. Potassium Hydroxide (KOH) Preparation**

**a.** Place a second sample on another slide. Add one drop of 10% potassium hydroxide (KOH) and a coverslip. A pungent, fishy odor upon addition of KOH--a positive whiff test--strongly indicates bacterial vaginosis.

**b.** The KOH prep may reveal candida in the form of thread-like hyphae and budding yeast.

**5. Cultures** are not routinely indicated, but they can verify candidiasis or trichomoniasis when a wet mount proves inconclusive.

**F. Screening for STDs:** Testing for gonorrhea and chlamydial infection should be considered for women with a new sexual partner, or purulent cervical discharge, cervical motion tenderness, symptoms of pelvic inflammatory disease, or if cervical friability and/or bleeding are noted.

**II. Differential Diagnosis**

**A.** The most common cause of vaginitis is bacterial vaginosis, followed by Candida albicans, with trichomoniasis on the decline.

**B.** The clinician must be alert to common nonvaginal etiologies, including contact dermatitis from spermicidal creams, latex in condoms or douching. In addition, any STD can produce vaginal discharge.

**III. Bacterial Vaginosis**

**A.** Bacterial vaginosis develops when a shift in the normal vaginal ecosystem results in replacement of the usually predominant lactobacilli with mixed bacterial flora. Bacterial vaginosis is the most common type of vaginitis.

**B.** There is usually little or no inflammation of the vulva or vaginal epithelium. There is little itching, no pain, and the symptoms tend to have an indolent course characterized by chronic vaginal discharge and postcoital odor.

**C.** Vaginal discharge and a "fishy" odor may be more frequently noticeable after intercourse.

**D. Diagnostic Findings**

1. Clue cells (saline slide shows epithelial cells covered with bacteria).
2. Positive whiff test (fishy odor with KOH)
3. Homogeneous, white, adherent discharge
4. Culture for this organism should be avoided because of poor specificity.

**E. Recommended Treatment Regimen**

1. Bacterial vaginosis can be eliminated with oral or topical therapies.
2. Metronidazole (Flagyl) 250 mg PO tid for 7 days. A single oral dose has a lower cure rate and a higher relapse rate compared with the 7 day regimen.
   a. **Side Effects:** Nausea, heartburn, metallic taste. Emetic effect with alcohol (Antabuse effect).
   b. Contraindicated in the first trimester of pregnancy because of a small teratogenic potential.
3. **Topical Therapies**
   a. Topical therapies have a 90% cure rate and a low risk of adverse reactions. Cream mineral oil base may weaken latex condoms and contraceptive diaphragms.
   b. Metronidazole gel (MetroGel), one applicatorful bid, morning and evening, for 5 days.
   c. Clindamycin cream, 2% (Cleocin) one applicatorful (5 g) at bedtime for 7 nights.
4. Routine treatment of sexual partners is not recommended.

**F. Persistent Cases:** Reevaluate and exclude other infections, including trichomonas.

1. Clindamycin, 300 mg orally bid for 7 days.
2. Treatment of sexual partners is considered in persistent or recurrent cases.

## IV. Candida Vulvovaginitis

**A.** Candida is the second most common diagnosis associated with vaginal symptoms. It is found in 25% of asymptomatic women. True fungal infections account for less than 33% of all vaginal infections.

**B. Possible Risk Factors:** Use of oral contraceptives, antibiotics, diabetes, intestinal colonization by Candida, tight clothing, sexual transmission, immunologic defects.

**C. Symptoms and Signs:** Marked itching, thick, white, odorless discharge; vulvar or vaginal erythema. Thrush appears as white plaques loosely attached to mucous membranes.

**D. Potassium Hydroxide Preparation** reveals hyphae or budding yeast forms. Rapid tests for Candida antigens are more sensitive than KOH preparation.

**E.** Cultures should be obtained only if treatment failure or recurrence of symptoms. Candida on Pap smear is specific but not sensitive.

**F. Treatment of Candida Vulvovaginitis**

1. For severe symptoms and chronic infections use a 7-day course of treatment instead of a 1 day or 3 day course. If there is extensive vulvar involvement, use an intravaginal cream instead of a suppository.

   Miconazole (Monistat 7) 2% cream, one applicatorful (5 g) intravaginally for 7 nights (OTC); or 200 mg vaginal suppository, one suppository for 3 nights; or 100 mg vaginal suppository, one

suppository for 7 nights (OTC).

Terconazole (Terazol 7), 0.4% cream, one applicatorful (5 g) intravaginally for 7 nights; or (Terazol 3) 0.8% cream, one applicatorful (5 g) intravaginally for 3 nights; or 80 mg suppository, 1 suppository for 3 nights; terconazole is superior to treatment with miconazole or clotrimazole.

Butoconazole (Femstat) 2% cream, one applicatorful (5 g) intravaginally for 3 nights. Can be used for 6 days, if needed.

Clotrimazole (Gyne-Lotrimin) 1% cream, one applicatorful (5 g) intravaginally for 7 nights; or 100 mg vaginal tablet for 7 nights (OTC); or 100 mg vaginal tablet, two tablets for 3 nights; or 500 mg vaginal tablet, one tablet single application.

Tioconazole, 6.5% (Vagistat), one applicatorful (5 gm) intravaginally one time.

Creams and suppositories are oil-based and may weaken latex condoms and diaphragms.

**G. Oral Regimens for Resistant or Recurrent Candida Cases:**

Fluconazole (Diflucan), 150 mg PO one time [150 mg]
Ketoconazole (Nizoral), 200 mg PO bid for 5 nights
Itraconazole (Sporanox), 200 mg PO one time

**H. Resistant or Recurrent Cases**

1. Reexamine and possibly culture.
2. Repeat topical therapy for a 14-21-day course. Oral regimens have enhanced patient compliance and the potential for eradicating rectal reservoirs.
3. Treatment of sexual partners and condom usage should be considered.
4. Patients with recalcitrant disease should be evaluated for diabetes and HIV because these patients have a higher incidence of vaginal candidiasis.

**I. Prophylactic Regimens for Frequent Infections**

Fluconazole (Diflucan), 100-150 mg PO once each week [100,150 mg]
Clotrimazole (Gyne-Lotrimin), one 500-mg vaginal tablet each week
Ketoconazole (Nizoral), 100 mg PO each week

**J. Personal Practices:** Advise loose-fitting cotton undergarments and use of sanitary napkins rather than tampons. Advise against douching.

## V. Trichomonas Vaginitis

**A.** Trichomonas is a flagellated anaerobic protozoan and is a sexually transmitted disease.

**B.** This disease elicits an acute inflammatory response in the vaginal epithelium with severe vaginal and vulvar itching or irritation, dysuria, dyspareunia, or an abnormal vaginal odor.

**C.** Fiery red vaginal mucosa and a profuse, yellow-green, bubbly, vaginal discharge is common. The disease is asymptomatic in 50% of women and 90% of men.

**D.** A strawberry cervix (scattered red macules) is uncommonly seen.

**E. Diagnosis:** Motile trichomonads are observed on normal saline preparation; >10 white blood cells per high-power field is common. Diagnosis of trichomonas by Pap smear is unreliable and should be confirmed by a saline preparation. Culture documentation by modified Diamond is usually not required.

**F. Treatment of Trichomonas Vaginitis**

1. Metronidazole (Flagyl), 2 g PO in a single dose for both the patient and

sexual partner, or 500 mg PO bid for 7 days, or 250 mg tid for 7 days. Metronidazole should be taken with food to avoid GI distress.

2. Topical therapy is not recommended because the organism may persist in the urethra and Skene's glands after local therapy.
3. The patient should be evaluated for coexisting sexually transmitted diseases.
4. **Persistent Cases:** Consider noncompliance, reinfection, metronidazole resistance, inaccurate diagnosis, or infection with multiple sexually transmitted diseases.
5. If persistence of trichomonas occurs, retreatment of the patient and partner is indicated using standard dosages. Higher dosages may be used, such as metronidazole 2 g PO qd for three days or 500 g PO bid for 14 days with intravaginal metronidazole gel (MetroGel), 5 g intravaginally bid for 5 days.

## VI. Other Diagnoses Causing Vaginal Symptoms

**A.** One-third of patients with vaginal symptoms will not have laboratory evidence of bacterial vaginosis, Candida, or trichomonas.

**B.** Other causes of the vaginal symptoms should be considered, including cervicitis, allergic reactions, and vulvodynia.

**C.** **Atrophic Vaginitis** should be considered in postmenopausal patients with burning and dyspareunia. The mucosa appears pale and thin with flat folds; wet-mount findings will be negative. Treatment is topical estrogen cream, which may be taken concomitantly with oral hormone replacement therapy.

**D.** **Allergy** is a very unusual cause of vaginal symptoms. Symptoms can result from Candida allergy or semen protein allergy. Systemic antihistamines may be helpful.

# Obstetrics

## Prenatal Care

**Charting Information for each Clinic Visit:**
**Initial Visit:** Perform a pelvic examination at the initial visit to determine uterine size and gestational age.
**Each Follow-up Visit Ask:** Fetal movement? Vaginal discharge or spontaneous rupture of membranes? Symptoms of preterm labor (PTL)? Vaginal bleeding? Pregnancy induced hypertension symptoms (blurred vision, headache, rapid weight gain, edema).
**Check lab results from previous visit.**
**Each Visit Document:** Fundal height. Fetal heart tones (FHT's). Check BP; attempt to assess fetal presentation at 36 weeks. Confirm estimated date of confinement (EDC). Cesarean section scar type and determine type of C-section (low transverse or classical). Check urine dipstick glucose/protein. Schedule return visit.

**Weight Gain:**

| Prepregnancy | BMI | Recommended net wt gain |
|---|---|---|
| underweight | <19.8 | 28-40 lbs |
| acceptable | 19.8-26.0 | 25-35 lbs |
| overweight | 26.0-29.0 | 15-25 lbs |
| severely overweight | >29.0 | 15 lbs |

BMI=body mass index= Prepregnancy weight in kg ÷ height in meters squared (if height is measured in centimeters, then multiply result by 100)

**Recommended Caloric Content:**
(patients optimal body weight in Kg) x (35 Kcal) + 300 Kcal

**Normal Weight Gain in Pregnancy:**
First Trimester - 2.5 lbs
8-20 weeks - 0.7 lb/week
20-40 weeks - 1 lb/week

**Frequency of Prenatal Care Visits:**
<28 weeks ..... every 4-5 weeks
28 - 36 weeks ..... every 2 weeks
36 - delivery ..... every 1 week

**Initial Visit Lab Tests:** CBC, blood type, Rh, antibody screen, rubella, VDRL/RPR, hepatitis B surface Ag, pap smear; urine pregnancy test, UA and urine C and S, GC, chlamydia; PPD; if high risk: group B strep, sickle prep, HIV.
**50 gm glucose tolerance test (1 hour post glucola):**
A glucose tolerance test should be done at the initial visit if any of the following risk factors are present: obesity, family history diabetes, age >30 yrs old, history of glucose intolerance, macrosomia, stillbirths, congenital anomalies, preeclampsia or polyhydramnios.

**Medications:**
FeSO4 325 mg PO bid-tid.
Prenatal vitamins PO qd
**First Trimester Education:** Discuss vitamins, smoking, alcohol, exercise, diet, sexuality, common discomforts. Danger signs: bleeding or cramping

**At 15-20 wks:** Maternal serum alpha fetoprotein. Amniocentesis should be offered in 2nd trimester if ≥35 yrs, presence of birth defect in mother, father, or in previous offspring.

**At 16-18 weeks** Screening ultrasound for dates if indicated.
Second Trimester Education: Observe date of quickening. Discomforts include backache, round ligament pain, constipation, indigestion. Discuss breast feeding. Danger signs: vaginal bleeding, lower abdominal cramps, fever, dysuria.

**At 24-28 wks:** Perform a 50 gm glucose load test. If 1 hour test >140 mg/dL, perform 3-hour glucose tolerance test. If Rh negative, draw antibody screen and administer RhoGAM at 28 wks. Repeat CBC if initially anemic.
**Third trimester (28-40 wks) Education:** discuss signs of labor: (primiparas to call physician when rupture of membrane or contractions q5min). Discuss postpartum birth control, tubal ligation, pediatrician selection, circumcision, child birth education classes, labor analgesia options. Common discomforts: cramps, edema, frequent urination. Danger signs: preterm labor, rupture of membranes, bleeding, edema, signs of preeclampsia.

**At 36 wks:** Cervical exam q1week if history of early delivery. Determine fetal position. If high risk, check: hemoglobin/hematocrit, VDRL/RPR, GC and chlamydia.

## Obstetric History and Physical

**Chief compliant:** contractions, rupture of bag of water, or other chief complaint.
**HPI:** ___ year old Gravida Para. [TPAL = full term (≥38 wks), pre-term (<38 wks), abortion (<20 wks), living].
Gestational age, last menstrual period, estimated date of confinement.
Contractions**:** (onset, frequency, intensity), rupture of membranes (time, color).
Vaginal bleeding (consistency, quantity, number of pads); fetal movement.
**Fetal Heart Rate Strip:** baseline rate, accelerations, reactivity, decelerations, contraction frequency.
**Dates:** 1st day of last menstrual period, estimated date of confinement. Ultrasound dating. Date of first positive pregnancy test. Check records to verify that uterine size by exam has equaled dates before 16 wks, verify the date of first Doppler heart tones (10-12 wks) and quickening (17 wks). Check the current fundal height, estimated fetal weight.
Assess the overall accuracy of dates.
**Prenatal Care:** Date of first exam, number of visits; has size = dates ?; infections, hypertension, diabetes, abnormal weight gain.
**Obstetrical History:** Date of pregnancy, gestational age, route (C-section

with indications), weight, complications, length of labor. Preeclampsia, abruption, previa, preterm labor.
**Gynecologic History:** Menstrual history (menarche, interval duration), herpes, gonorrhea, chlamydia, abortions. History of oral contraceptives.
**Past Medical History:** Illnesses, asthma, tuberculosis, hypertension, diabetes, seizures; renal or heart disease; surgeries.
**Medications:** Iron, prenatal vitamins.
**Allergies:** penicillin ?
**Social History:** Smoking, alcohol, drug use, occupation.
**Family History:** Hypertension, diabetes, tuberculosis, bleeding disorders, twins, congenital anomalies.
**Review of Systems:** Severe headaches, scotomas, blurred vision, hand and face edema, epigastric pain, pruritus, dysuria, flank pain, fever.

**PHYSICAL EXAM**
**General Appearance:**
**Vitals:** BP, pulse, respirations, temp, weight, height. Urine dipstick for protein/glucose.
**HEENT:** Funduscopy, facial edema, thyroid, JVD.
**Chest:** Auscultation, breast tenderness, masses,
**Cardiovascular:** Rhythm, S1, S2, murmurs, gallops.
**Abdomen:** Fundal height, Leopold's maneuvers (lie, presentation). Estimated Fetal Weight (EFW), tenderness, scars.
**Cervix:** Dilatation, effacement, station, position, status of membranes, presentation. Vulvar herpes lesions. If undiagnosed vaginal bleeding, never do a digital exam. If ruptured membranes, defer digital exam, and perform sterile speculum exam for fernning, pooling, nitrazine.
**Extremities:** cyanosis, clubbing, edema, calf tenderness.
**Neurologic:** Deep tender reflexes, clonus.
**Prenatal Labs:** One hour post glucola, RPR/VDRL, rubella, blood type, Rh, CBC, PAP, PPD, Hepatitis BsAg, UA, C and S, glucose tolerance test.
**Current Labs:** Hemoglobin, hematocrit, glucose, UA.
**Assessment:** Intrauterine pregnancy (IUP) at ____ weeks, admitted with following list of problems:
**Plan:** Anticipated type of labor and delivery. List plan for each problem:

# Labor and Delivery Admitting Orders

**Admit:** Labor and Delivery
**Diagnoses:** IUP at ____ weeks.
**Condition:** satisfactory
**Vitals:** q1-4 hrs per routine; external monitors
**Activity:** may ambulate in latent phase; bed rest in active phase, left lateral, decubitus.
**Nursing:** I and O, urine output. Catheterize prn; external or internal monitors.
**Diet:** NPO except ice chips.
**IV Fluids:** Lactated Ringers ± 5% dextrose at 125 cc/h.
**Labs:** CBC, dipstick urine protein.
If indicated: blood type and Rh, antibody screen. Clean catch UA. VDRL, HBsAg, rubella, urine C and S. Type and screen (C-section).
**Medications:**
Epidural at 4-5 cm.
Butorphanol (Stadol) 2 mg IM q3-4h or 0.5 - 1 mg IV q1.5-2h **OR**
Meperidine (Demerol) 50-100 mg IM q3-4h or 25-75 mg slow IV q1.5-3h **AND**
Promethazine (Phenergan) 25-50 mg, IM, IV q3-4h prn **OR**
Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn **OR**
Nalbuphine (Nubain) 5-10 mg IV/SC q2-3h
Fleet enema PR prn constipation.
Naloxone (Narcan)(narcotic depression) 0.4 mg IV/IM (adult) or 0.01 mg/kg (neonate).

# Spontaneous Vaginal Delivery

1. Take the patient to the Delivery room when the patient is completely dilated and pushing. Position patient in the dorsal lithotomy position, which increases the diameter of the pelvic outlet.
2. The operator should scrub, gown and mask. Cleanse perineum with Betadine and drape.
3. The fetal head will become increasingly visible as the vaginal outlet is stretched, and crowning occurs. Allow the head to gradually extend the perineum.
4. Evaluate the need for local anesthesia and episiotomy if required.
5. The head will usually present occiput anterior (the back of the fetal head will be upward). The head will extend upward as it leaves the birth canal.
6. After delivery of the head, the head will spontaneously rotate to the left or right side to a transverse position.
7. Check for a nuchal cord by passing a finger around neck, and palpate for the cord. If a nuchal cord is present, raise it over the fetal head, and allow it to retract into the birth canal. If the cord cannot be carried over the head, apply two clamps and cut the cord between the clamps.
8. Suction the mouth, then the nares. If meconium is present, use a DeLee trap to suction.
9. With the infant's head in a transverse position, grasp the sides of the head, and apply gentle, downward traction until the anterior shoulder appears under the pubic arch. Next, lift the infant in an forward, upward movement to deliver the posterior shoulder and remainder of the body.
10. As the body is delivered, use your right hand to cradle the infants's back and pivot the infants's body around towards the operator. Support the baby's body with your left forearm, and cradle the shoulders and neck with

your left hand.

11. Use right hand to suction the mouth first, then suction the nares. Keep the infant's head slightly lower than the body to facilitate drainage of pulmonary fluid.
12. Clamp the cord with two clamps, and cut the cord with scissors between the clamps, taking care not to allow blood to splatter.
13. Take the infant to the warmer, and dry the baby. Resuscitate the baby if necessary.
14. If the baby is stable, take the child to the mother and check for the possibility of twins by palpating for a second head.
15. Obtain cord blood by slowly releasing the placental cord clamp. Obtain 2 red top tubes and a purple top tube. Count the number of vessels in the cord; three vessels is normal.
16. Deliver the placenta spontaneously. Use only light traction on the cord. Note the appearance of the placenta and ensure that it is fully intact.
17. After delivery of the placenta inject 10-20 units of Pitocin into the IV bag containing 500-1000 cc of fluid to contract the uterus, and apply gentle bimanual uterine massage to reduce bleeding.
18. Examine the perineum and birth canal, and repair any tears with 3-0 Vicryl or Chromic sutures. Examine the area thoroughly for bleeding, and verify that the rectum is intact.
19. Clean the perineum, remove the drapes, and assist the patient in removing legs from leg supports.
20. Take the patient to the recovery room, write a delivery note, write post partum orders, and sign the birth certificate.

## Delivery Note

1. Note the Age, gravida, para, gestational age.
2. Time of birth, type of birth (NSVD), position (left occiput anterior).
3. Bulb suctioned, sex, weight, APGAR scores, nuchal cord; number of cord vessels.
4. Placenta expressed spontaneously intact, episiotomy (degree) repaired.
5. Note lacerations of cervix, vagina, rectum, perineum.
6. Estimated blood loss:
7. Disposition: Mother to recovery room in stable condition. Infant to nursery in stable condition.

## Routine Postpartum Orders

**Transfer:** To recovery room then postpartum ward when stable.
**Vitals:** Check vitals, bleeding, fundus, q15min x 1 hr. or until stable than q4h.
**Activity:** ambulate in 2 hours if stable
**Nursing Orders:** If unable to void, may straight cath; sitz baths prn with 1:1000 Betadine prn, ice pack to perineum prn, breast binder or pump prn, record urine output.
**Diet:** regular
**IV Fluids:** D5LR with 20 units Pitocin per liter at 125 cc/h. Discontinue when stable and taking PO diet.
**Medications:**

Oxytocin 10-20 units in 1 L D5LR (300 CC bolus then remaining 700 CC over 8 hrs) or 10 U IM.
FeS04 325 mg PO bid-tid.
Multivitamin PO qd.
**Symptomatic Medications:**
Meperidine (Demerol) 50-75 mg IM q3-4h prn **OR**
Acetaminophen/Codeine (Tylenol #3) 1-2 tab PO q3-4h prn.
Milk of Magnesia 30 ml PO q6h prn constipation **OR**
Docusate Sodium (Colace) 100-200 mg PO bid **OR**
Dulcolax suppository PR prn constipation.
Tucks pads, Epifoam or Dermoplast at bedside.
A and D cream or Lanolin prn if breast feeding.
Breast binding or tight brazier and ice packs prn if not to breast feed.
**Labs:** Hemoglobin/hematocrit on post partum day 1. If indicated: Type and screen for RhoGAM or give rubella vaccine if indicated (titer <1:10).

## Post Partum Discharge Instructions

1. Pelvic rest (no sex, douching or tampons) for 6 weeks. Return to emergency room if temperature >100.5, increased pain, bleeding, or other problems.
2. Acetaminophen with codeine (Tylenol #3) 1-2 PO q4-6h prn pain.
3. Docusate (Colace) 100 mg PO bid prn constipation.
4. FeSO4 325 mg PO bid-tid.
5. Multivitamin PO qd. Oral contraceptives: Start in 2-3 weeks; progesterone only OCP if breast feeding or regular OCP if not breast feeding.
6. Return to clinic in 4-6 weeks; 2 and 6 weeks if C-section.

# Surgical Obstetrics

## Perineal Lacerations and Episiotomies

**First Degree Laceration:**

**Definition:** Laceration of the perineum that extends only through the vaginal and perineal skin.

**Repair:** Place a single layer of interrupted 3-O chromic or vicryl sutures about 1 cm apart. Avoid unnecessary trauma to tissue especially close to the periurethral and clitoral area.

**Second Degree Laceration and Repair of Midline Episiotomy:**

**Definition:** A laceration that extends deeply into the soft tissues of the perineum, down to but not including the external anal sphincter capsule. The disruption involves the bulbocavernosus and transverse perineal muscles.

**Repair:** Identify the apex of the vaginal laceration. Suture the vaginal laceration with a running, locking 3-O chromic or vicryl suture up to the hymenal margin. Pass the suture through the vaginal mucosa under the hymenal margin into the perineal body. Put the loose end of this suture on a sterile field at the suprapubic area, to be used later. Next proximate the deep layer of the perineal body by placing 3-4 interrupted 2-O or 3-O chromic or vicryl sutures. Then use the previously placed vagina suture to reapproximate the superficial layers of the perineal body with a running suture extending to the bottom of the episiotomy, then turn upward to the hymenal margin. Close the skin with the same suture in a running subcuticular fashion. Tie off the suture and remove the needle.

**Third Degree Laceration:**

**Definition:** Extends through the perineum and extends through the anal sphincter.

**Repair:** First identify each severed ends of the external anal sphincter capsule, and grasp each end with an Allis clamp. Proximate the capsule of the sphincter with 4 interrupted sutures of 2-O or 3-O vicryl suture. Make sure the sutures do not penetrate the rectal mucosa. Continue the repair as a second degree laceration as above. Use stool softeners and sitz baths post-partum.

**Fourth-Degree Laceration:**

**Definition:** A laceration that extends through the perineum, anal sphincter, and extends through the rectal mucosa to expose the lumen of the rectum.

**Repair:** Irrigate the laceration with sterile saline solution. Identify the anatomy, including the apex of the rectal mucosal laceration. Approximate the rectal submucosa with a running suture using a 3-O chromic suture on a GI needle extending to the margin of the anal skin. Place a second layer of running suture to invert the first suture line, and take some tension from the first layer closure. Next identify and grasp the torn edges of the external anal sphincter capsule with Allis clamps, and perform a repair as for a third-degree laceration, then close the remaining layers as for a second-degree laceration. Place the patient on a low-residue diet, stool softeners, and sitz

baths post-partum.

## Post Operative Cesarean Section Note

**Pre-op diagnosis:**
1. 23 year old $G_1P_0$, estimated gestational age = 40 weeks
2. Failure to progress
3. Non-reassuring fetal tracing

**Post-op diagnosis:** Same as above
**Procedure:** Primary low segment transverse Cesarean Section
**Attending Surgeon, Assistant:**
**Anesthesia:** Epidural
**Operative findings:** Weight and sex of infant, APGARs at 1 min and 5 mins; normal uterus, tubes, ovaries.
**Cord pH:**
**Specimens:** placenta, cord blood (type and Rh).
**Estimated Blood Loss:** 800 cc; no blood replaced.
**Fluids, blood and urine output:**
**Drains:** Foley to gravity.
**Complications:** None
**Disposition:** Patient sent to recovery room in stable condition.

## Cesarean Section Operative Report

**Preoperative Diagnosis:**
1. 23 year old $G_1P_0$, estimated gestational age = 40 weeks
2. Failure to progress
3. Non-reassuring fetal tracing

**Postoperative Diagnosis:** Same as above
**Title of Operation:** Primary Low Segment Transverse Cesarean Section
**Surgeon:**
**Assistant:**
**Anesthesia:** Epidural
**Findings At Surgery:** Male infant in occiput posterior presentation. Thick meconium with none below the cords, pediatrics present at delivery, APGAR's 6/8, weight 3980 g. Normal uterus, tubes, and ovaries.
**Description of Operative Procedure:** After assuring informed consent, the patient was taken to the operating room and epidural anesthesia was initiated. She was placed in the dorsal, supine position with left lateral tilt. The abdomen was prepped and draped in the usual sterile manner.

A Pfannenstiel skin incision was then made with a scalpel, and carried through to the level of the fascia. The fascial incision was extended bilaterally with Mayo scissors. The fascial incision was then grasped with the Kocher clamps, elevated, and both sharply and bluntly dissected superiorly and inferiorly from the rectus muscles.

The rectus muscles were then separated in the midline, and the peritoneum was tented up, and entered sharply with the Metzenbaum scissors. The peritoneal incision was extended superiorly and inferiorly with good visualization of the bladder.

A bladder blade was then inserted, and the vesicouterine peritoneum was identified, grasped with the pick-ups, and entered sharply with the Metzenbaum scissors. This incision was then extended laterally and the bladder flap was created. The bladder was retracted using the bladder blade. The lower uterine segment was incised in a transverse fashion with the scalpel, then extended bilaterally with bandage scissors. The bladder blade was removed, and the infants head was delivered atraumatically. The nose and mouth were suctioned with a DeLee trap, and the cord clamped and cut. The infant was handed off to the pediatrician. Cord gases and cord blood were sent.

The placenta was then removed manually, and the uterus was exteriorized, and cleared of all clots and debris. The uterine incision was repaired with 1-O chromic in a running locking fashion. A second layer of 1-O chromic was used to obtain excellent hemostasis. The bladder flap was repaired with a 3-O Vicryl in a running fashion. The cul-de-sac was cleared of clots and the uterus was returned to the abdomen. The peritoneum was closed with 3-0 Vicryl. The fascia was re-approximated with O Vicryl in a running fashion. The skin was closed with staples.

The patient tolerated the procedure well. Needle and sponge counts were correct times two. Two grams of Ancef was given at cord clamp, and a sterile dressing was placed over the incision.

**Estimated Blood Loss (EBL):** 800 cc; no blood replaced (normal blood loss is 500-1000 cc)
**Specimens:** Placenta, cord pH, cord blood specimens
**Drains:** Foley to gravity
**Fluids:** Input - 2000 cc LR; Output - 300 cc clear urine
**Complications:** None
**Disposition:** The patient was taken to the recovery room then postpartum ward in stable condition.

## Post Operative Management after Cesarean-Section

**I. Post Cesarean-Section Orders**

1. **Transfer:** to post partum ward when stable.
2. **Vital signs:** q4h x 24 hours, I and O.
3. **Activity:** bed rest x 6-8 hours, then ambulate; if given spinal, keep patient flat on back x 8h. Incentive spirometer q1h while awake.
4. **Diet:** NPO x 8h, then sips of water. Advance to clear liquids then to regular diet as tolerated.
5. **IV Fluids:** IV D5 LR or D5 1/2 NS at 125 cc/h. Foley to gravity, and discontinue 12-24 hours postop.
6. **Medications:**
   Cefazolin (Ancef) 1 gm IVPB x one dose at time of Cesarean section if patient was in labor.
   Meperidine (Demerol) 50-75 mg IM q3-4h prn pain **AND**
   Hydroxyzine (Vistaril) 25-50 mg IM q3-4h prn pain **AND**
   Prochlorperazine (Compazine) 10 mg IM q4-6h prn nausea **AND**
   Pentobarbital (Nembutal) 100 mg IM/PO qhs prn insomnia.
7. **Labs:** CBC in AM.

**II. Post Op day #1:**

1. Assess pain, lungs, cardiac status, fundal height, lochia, passing gas, bowel movement, distension, tenderness, bowel sounds, incision; calf tenderness.
2. Discontinue IV when taking adequate PO fluids.
3. Discontinue Foley, and I and O cath prn.
4. Ambulate tid with assistance; incentive spirometer.
5. Hematocrit and hemoglobin. Check Rh and rubella status.
6. Medications:
   Acetaminophen/codeine (Tylenol #3) 1-2 PO q4-6h prn pain.
   FeSO4 325 mg PO bid-tid.
   Multivitamin PO qd, Colace 100 mg PO bid, Ascorbic acid 500 mg PO bid. Mylicon 80 mg PO qid prn bloating.

**III. Post Op day #2:**

1. If passing gas and/or bowel movement, advance to regular diet.
2. Laxatives: Dulcolax supp prn, or Milk of magnesia 30 cc PO tid prn. Mylicon 80 mg PO qid prn bloating.

**Post Op day #3:**

1. If transverse incision, remove staples and place steri-strips. If a vertical incision remove staples on post op day #3-#5.
2. Discharge home on appropriate medications; follow up in 2 and 6 weeks.

# Postpartum Tubal Ligation Operative Report

**Preoperative Diagnosis:** Multiparous female status/post vaginal delivery. Desiring permanent sterilization.
**Postoperative Diagnosis:** Same as above
**Title of Operation:** Modified Pomeroy bilateral tubal ligation
**Surgeon:**
**Assistant:**
**Anesthesia:** Epidural
**Findings At Surgery:** Normal fallopian tubes bilaterally
**Description of Operative Procedure:** After assuring informed consent, the patient was taken to the operating room and epidural administered. A small, transverse, infraumbilical skin incision was made with the scalpel and was carried down through the underlying fascia until the peritoneum was identified and entered. The left fallopian tube was identified, brought to the incision and grasped with a Babcock clamp. The tube was then followed out to the fimbria. An avascular midsection of the fallopian tube was grasped with a Babcock clamp and brought into a knuckle. The tube was doubly ligated with an O-plain suture and transected. The specimen was sent to pathology.

Excellent hemostasis was noted, and the tube was returned to the abdomen. The same procedure was performed on the opposite fallopian tube. The fascia was then closed with 0-vicryl in a single layer. The skin was closed with 3-0 vicryl in a subcuticular fashion. The patient tolerated the procedure well. Needle and sponge counts were correct times 2. The patient was taken to the recovery room in stable condition.
**Estimated Blood Loss (EBL):** <20 cc
**Specimens:** Segments of right and left tubes
**Drains:** Foley to gravity

**Complications:** None
**Disposition:** The patient was taken to the recovery room in stable condition.

# *Antepartum Complications*

## Hyperemesis Gravidarum and Nausea and Vomiting in Pregnancy

**History:** Intractable vomiting causing acetonuria, weight loss, dehydration, or electrolyte imbalance; first trimester (peak at 10-12 weeks), worse in AM. Quantify vomiting, inability to keep solids or liquids down.
**Physical:** weight loss or inadequate weight gain, tachycardia; dry mucus membranes, poor skin turgor, fever; assess fetal heart tones, ketonuria.
**Differential Diagnosis:** Peptic ulcer, pyelonephritis, diabetes, cholelithiasis, cholecystitis, pneumonia, hyperthyroidism, bowel obstruction, volvulus, appendicitis, molar pregnancy.
**Labs:** SMA 7, ketones, urine specific gravity, CBC, liver function tests. HBsAg, hepatitis A IgM, amylase, lipase; UA, C and S, urine toxicology, gallbladder/pancreas/pelvic ultrasound.
**General Treatment:**
Bedrest 15min after awakening, crackers before arising from bed; begin clear liquid diet and advance slowly as tolerate. Obtain admission and daily weight. Give antiemetic ½ hour prior to meals, small carbohydrate and fiber rich meals; 6 meals/day, avoid greasy, spicy foods; minimize fluid with meals. Dietary and social work consults.
IV Normal saline at 1-4 L over 1-4h, then D5LR with 20-40 mEq KCL/L at 150-175 ml/h until ketones cleared. I and O, daily weights, urine ketones q8h.
**Treatment of Nausea and Vomiting:**
Orthophosphoric acid, dextrose (Emetrol), 1-2 tablespoons PO q15 min prn, nausea or vomiting or give 1-2 tablespoons PO on arising and q3h **OR**
Trimethobenzamide (Tigan) 200 mg suppository PR tid **OR**
Prochlorperazine (Compazine) 5-10 mg IM/IV/PO q4-6h or supp 25 mg PR q6-8h prn **OR**
Promethazine (Phenergan) 12.5 - 25 mg PO or PR q4-6h prn nausea and vomiting (max 100 mg/24h) **OR**
Droperidol (Inapsine) 2.5 mg IM/IV q6h prn or give 2.5 mg bolus, then 1 mg/h [25 mg in 500 ml D5W (0.05 mg/ml)]
Hydroxyzine (Vistaril) 25-50 mg IM/PO q4-6h **AND**
Multivitamin (MVI-12) SLN in IV solution or PO qd.

## Rh Negative Pregnancy

1. **If Antibody Rh Screen Negative:** Draw paternal blood type and Rh. If paternal blood is Rh positive wait until 28-32 wks and draw maternal antibody screen, if negative administer Rh immune globulin (RhoGAM) 300 mcg IM.
2. **At 40 wks:** (at least 12 wks after RhoGAM) draw maternal antibody screen if negative administer 300 mcg RhoGAM IM.
3. **If Postpartum and RhoGAM was Not Given at 40 wks:** draw maternal antibody screen and Rh of newborn. If newborn is Rh positive and maternal antibody screen negative, administer 300 mcg RhoGAM (only if RhoGAM was not given at 40 wks).

**Ectopic, Pregnancy termination after 6 weeks, Amniocentesis, Cardiocentesis, Chorionic Villus Sampling, Spontaneous Abortion, Trauma, Abruptio, Fetal-Maternal hemorrhage, External Version (not if received dose recently at 28-32 wks):**

RhoGAM 300 mcg IM within 72 hrs of procedure.

**Pregnancy that terminates ≥12 wks or Pregnancy Termination with unknown gestation age:**

RhoGAM 300 mcg IM.

**Pregnancy termination before 12 weeks:**

RhoGAM 50 mcg IM.

**Assessment of Degree of Hemorrhage:** Kleihauer-Betke: number of fetal cells ÷ by number of maternal cells x estimated maternal blood cell volume = ml of fetal-maternal bleed. (>15 ml of fetal cells requires larger dose of RhoGAM).

## First Trimester Bleeding

**Basic Definitions:**

**Abortion** - Termination of a pregnancy <20 weeks (estimated fetal weight <500 grams).

**Threatened Abortion:** Uterine bleeding without cervical dilation and no expulsion of tissue <20 weeks.

**Inevitable Abortion** - Uterine bleeding with cervical dilatation and no expulsion of tissue <20 weeks.

**Incomplete Abortion** - Passage of some of products of conception through cervix <20 weeks.

**Complete Abortion** - Spontaneous expulsion of all products of conception from uterus <20 weeks.

**Missed Abortion** - Fetal death <20 weeks without expulsion of tissue.

**Induced Abortion** - Intentional termination of a pregnancy <20 weeks; elective if requested by patient. Therapeutic if abortion indicated for maintaining health of mother.

**History:** Quantity of bleeding, pelvic pain, cramps, positive pregnancy test. Fever, drug use, smoking, alcohol, uterine surgery or anomalies, incompetent cervix.

**Physical:** Assess hemodynamic status; pulse and blood pressure; determine rate of blood loss, uterine size. Fever, bleeding from cervical os or cervical dilatation. Cervical erosions, polyps; fetal heart tones.

**Differential Diagnosis:** Threatened abortion, incomplete abortion, ectopic, cervicitis, vaginitis, cervical or vaginal neoplasia, hydatiform mole.

**Labs:** CBC, serum quantitative HCG, transvaginal ultrasound, Rh; type and cross or screen for PRBC. PT/PTT, cervical cultures, GC, chlamydia.

**Threatened Abortion:**

Stabilize with IV D5LR or blood. Bedrest and sexual abstinence. Increased fluid intake. If Rh negative, give RhoGAM: <13 wks, 50 mcg IM; ≥13 wks, 300 mcg IM.

**Inevitable Abortion:**

Stabilize with IV NS or LR. If Rh negative, give RhoGAM as above. Perform dilation and curettage (D and C).

**Incomplete Abortion:**

IV fluids: LR or NS with 30 U oxytocin per liter at 150 ml/h or greater; remove products of conception in cervical canal. Suction D and C when stable. If Rh negative, give RhoGAM as above.

After D and C give methylergonovine (Methergine) 0.2 mg PO qid x 6 doses if necessary for bleeding.

FeS04 325 mg PO tid-qid.

**Completed Abortion:**

Patient may be followed expectantly with serial beta hCG testing, until zero, if no tissue available for pathology. After D and C give methylergonovine (Methergine) 0.2 mg PO qid x 6 doses if necessary for bleeding. If Rh negative give RhoGAM, see above.

**Missed Abortion:** Consider dilation and curettage if < 12-14 weeks size **OR** if >14 week size, consider the following:

Oxytocin 40 units in 1 L of D5 LR at 1 mU, double rate q20-30min until contractions are adequate.

Intra-amniotic prostaglandin f2 alpha **OR**

Prostaglandin E2 20 mg suppositories intravaginally q3h until contractions are adequate **OR**

Prostaglandin F2 alpha (Intra-amniotic), test dose of 1 ml (6 mg/ml), then give 40 mg vial slowly **OR**

D and E (Dilatation and Evacuation) at 14-20 weeks.

## Incompetent Cervix

**Definition:** Repetitive second trimester pregnancy loss; characterized by painless effacement and dilatation of the cervix without labor or associated uterine activity, bleeding or fluid leakage. A high index of suspicion is important with a past history of recurrent losses <26 weeks.

**Etiology:** Multifactorial, idiopathic, abnormal cervical structure, biochemical alterations, uterine malformations, DES exposure, cervical trauma, laceration, operative delivery, cone biopsy, dilatation and curettage, multiple gestation.

**History:** Vaginal or lower abdominal pressure sensation, watery or bloody discharge; gradual painless dilatation and effacement of the cervix; history of short labor courses, premature rupture of membranes at 18-26 weeks.

**Differential Diagnosis of Second Trimester Loss:** Incompetent cervix, chromosomal abnormalities, immunologic factors (collagen vascular disease), infection (cervicitis), preterm labor, uterine anomalies, leiomyomata, hormonal factors (Relaxin), endocrine disease (thyroid, diabetes mellitus), diethylstilbestrol exposure.

**Diagnosis:** A high index of suspicion should be maintained with a past history of recurrent second trimester losses.

**Tests for Incompetent Cervix, Performed Prior to Pregnancy:**

1. Passage of a #8 Hegar dilator easily through cervical canal in luteal phase.
2. Dilatation of the canal (>7 mm) on hysterosalpingogram.
3. Intracervical balloon test: Pediatric Foley catheter filled with 3 cc, and the bulb is withdrawn through the internal os without resistance.

**Management:**

**Surveillance:** Patient education about preterm labor, abnormal discharge, and pelvic pressure. Frequent cervical evaluations from 14-28 weeks. Consider transvaginal ultrasound to determine shortened cervical length, dilatation or bulging membranes at internal os.

**Treatment:**

1. Elective cervical cerclage (McDonald or Shirodkar) at 14-16 weeks.
   **Contraindications to Cerclage:** Uterine contractions, ruptured membranes, chorioamnionitis, suspected fetal malformations, fetal death, cervical dilatation >4 cm.
2. Preoperative Evaluation: Ultrasound for fetal viability and detection of anomalies, cervical cultures (GC, chlamydia, group B strep).
3. No intercourse one week prior to cerclage, consider amniocenteses to rule out chorioamnionitis if suspected.
4. **Cerclage Techniques:** McDonald procedure, Shirodkar procedure with Mersilene tape, or transabdominal cerclage.
5. Perioperatively, consider prophylactic antibiotics or tocolytic therapy. Decrease physical activity and sexual intercourse x 2 weeks.
6. Remove the cerclage at 37 weeks or when in labor.

# Tuberculosis

**I. Pathophysiology of Tuberculosis**

**A.** In most individuals initially infected with mycobacterium tuberculosis (usually by respiratory aerosols), the primary pulmonary infection occurs early in life, and the organism is contained by host defenses. The primary infection usually resembles pneumonia or bronchitis, and the infection usually resolves without treatment.

**B.** Later in life, the organism may escape immunological control and cause reactivation disease, usually pulmonary, but many anatomic sites can be involved (genitourinary system, bones, joints, meninges, brain, peritoneum, and the pericardium).

**II. Risk Factors for Tuberculosis**

**A.** Infection with human immunodeficiency virus (HIV) is the most important risk factor for development of tuberculosis.

**B.** Elderly residents of long-term care facilities are at risk for reactivation of tuberculosis and for primary tuberculosis from nosocomial transmission.

**C.** Household and close contacts of TB infected patients and recent PPD converters are at risk.

**D.** Prolonged steroid therapy, immunosuppressive therapy, diabetes mellitus, silicosis, rapid weight loss or malnutrition, malignancy, hemodialysis also are risk factors.

**III. Diagnosis of Active Tuberculosis**

**A.** Diagnosis of active tuberculosis rests upon sputum examination for acid fast bacilli and subsequent culture of the specimen to identify antibiotic sensitivities. This process requires 4-6 weeks for identification and another 4-6 weeks for sensitivity testing.

**B.** Sensitivity testing is more rapid with DNA polymerase chain reaction (PCR); however, this test is not yet available.

**C.** Tuberculosis is often the initial manifestation of HIV infection; serologic testing for HIV is recommended in all tuberculosis patients. Tuberculosis in HIV-infected patients is characterized by extrapulmonary disease in 70% of patients.

## IV. Treatment of Active Tuberculosis

**A.** Suspected TB should be treated with a 4 drug combination as empiric therapy due to the high rates of drug resistance.

**B.** The four-drug regimen consists of Isoniazid (INH), rifampin, pyrazinamide (PZA), and either ethambutol or streptomycin. A modified regimen is recommended for patients known to have INH-resistant TB.

**C.** All patients diagnosed with TB now must be treated with the four-drug regimen for 8 weeks, followed by 18 weeks of INH and rifampin.

**D.** The same approach should be used in both HIV-positive and HIV-negative patients.

**E.** If multi-drug resistant TB (resistant to both INH and RIF) is encountered, therapy should be more prolonged and guided by antibiotic sensitivities and repetitive sputum cultures.

**F.** Vitamin B6 (pyridoxine) should be added for malnourished patients taking INH.

**G.** Directly observed therapy, usually on a twice per week basis, should be instituted in situations where compliance is questioned.

**H. Drugs Used in Chemotherapy of TB**

| | | |
|---|---|---|
| Isoniazid | 5-10 mg/kg (300 mg) | hepatitis, peripheral neuropathy |
| Rifampin | 10-15 mg/kg (600 mg) | hepatitis, purpura |
| Pyrazinamide | 25 mg/kg (max 2 g) | hepatotoxicity, skin rash |
| Ethambutol | 15-25 mg/kg (max 2.5 g) | Retrobulbar neuritis, skin rash |

**I.** Rifamate is a combination capsule of 150 mg of isoniazid and 300 mg of rifampin.

**J. Monitoring During Therapy:**

1. Symptoms improve within 4 weeks, and sputum cultures become negative within 3 months in patients receiving effective antituberculosis therapy. Delayed resolution of symptoms or persistently positive cultures indicate noncompliance or drug-resistance.
2. Sputum cultures should be obtained monthly until they are negative and also after completion of therapy. Obtain a chest x-ray after 2-3 months, and after completion of treatment to assess efficacy and to provide a baseline for comparison in the event of relapse.

**K. Monitoring for Drug Toxicity:**

1. Isoniazid, rifampin, and pyrazinamide are potentially hepatotoxic.
2. If transaminase levels increase to more than 5 times the upper limit of normal, isoniazid, rifampin, and pyrazinamide should be discontinued and alternative agents substituted.
3. Optic neuritis can result from ethambutol.

## V. Skin Testing for Tuberculosis

**A.** Skin testing with purified protein derivative (PPD) has limited usefulness in determining the presence of active disease, but is more useful in detecting patients who are harboring latent tuberculosis who may need "prophylactic" therapy.

**B.** A reactive tuberculin skin test supports the diagnosis of tuberculosis, but it is not specific.

**C.** The skin test should be performed with controls and should utilize 5 tuberculin units in an intradermal injection. The test is read at 48 hrs and must be interpreted in combination with clinical and historical information. For example, a HIV positive individual has a positive PPD if 5 mm of induration is present, while a patient without other risk factors has a positive PPD only if 15 mm or more of induration is present.

**D.** If fluid leaks out of the blister, the test should be repeated. A ball point pen may be used to assess the amount of induration by tracing inward until the induration is encountered.

**E.** A history of vaccination with bacille Calmette-Guerin should be ignored in interpreting the results of tuberculin skin testing, because skin test reactivity from the vaccine declines by adulthood.

**F.** A negative tuberculin skin test and a positive control skin test makes the diagnosis of tuberculosis unlikely. Failure to react to control skin tests suggests anergy.

**VI. Chemoprophylaxis**

**A.** Chemoprophylaxis with isoniazid (INH) greatly decreases the likelihood of progression of latent tuberculous infection to active disease.

**B.** Before administration of chemoprophylaxis, active tuberculosis must be excluded clinically and by chest x-ray because inadvertent use of isoniazid alone in active tuberculosis may induce drug resistance.

**C.** Prophylaxis with 6-9 months of INH should be considered in the following patients:

**1.** Recent skin test converters (within the past 2 years) and close household contacts (who can then be re-tested at 3 months).

**2.** Patients with a positive PPD and an abnormal CXR (suggesting latent tuberculosis), patients with a positive PPD who are less than 35 years of age.

**3.** Patients who are PPD positive with one of the following:

**a.** Prolonged high dose steroid therapy

**b.** Immunosuppressive disease

**c.** Insulin dependent diabetes mellitus

**d.** Rapid weight loss or malnutrition

**e.** IV drug use

**f.** Dialysis for chronic renal failure.

**D.** In situations of exposure to INH resistant organisms, prophylaxis may be attempted with RIF and EMB for 12 months.

**E.** If age greater than 35, liver function tests should be measured initially and monthly while on INH.

## Antepartum Urinary Tract Infection

**History:** Dysuria, frequency, urgency, suprapubic discomfort, flank pain, fever nausea, vomiting, cystitis.

**Physical:** Afebrile, suprapubic tenderness; no costovertebral angle tenderness if cystitis.

**Incidence:** Asymptomatic bacteriuria 4-8%, acute cystitis 1-3%, pyelonephritis 1-2%. 30% of patients with untreated asymptomatic bacteriuria develop pyelonephritis.

**Labs:** UA, C and S.

**Pathogens:** E coli, Klebsiella, Proteus mirabilis, Pseudomonas, Enterobacter, Staph saprophyticus, Enterococcus, Group B strep.

**Asymptomatic Bacteriuria and Acute Cystitis:**

Treat 7-10 days; repeat culture after therapy and if asymptomatic bacteriuria, repeat q1month during pregnancy. Recurrent infection - treat 2-3 weeks. Reinfection - treat x 10 days, then low dose prophylaxis until 2 weeks postpartum.

Ampicillin 500 mg PO qid **OR**
Amoxicillin 500 mg PO tid **OR**
Sulfisoxazole (Gantrisin) 500-1000 mg PO qid **OR**
Nitrofurantoin monohydrate (Macrobid) 100 mg PO bid **OR**
Nitrofurantoin (Macrodantin) 100 mg PO qid **OR**
Trimethoprim/sulfamethoxazole DS (Bactrim DS) 1 tab PO bid (not in first trimester, OK after first trimester) **OR**
Cephalexin (Keflex) 250-500 mg PO qid

**Prophylaxis:**

Ampicillin 250 mg PO qhs **OR**
Nitrofurantoin 100 mg PO qhs **OR**
Erythromycin 250 mg PO qhs.

## Antepartum Pyelonephritis

**History:** Fever, chills; nausea, contractions, preterm labor; dysuria.
**Physical:** Fever, tachycardia, costovertebral angle tenderness.
**Labs:** UA, urine C and S by cath. CBC, SMA7. Renal ultrasound, single shot intravenous pyelogram.
**Etiology:** E coli, Klebsiella, Proteus mirabilis, P aeruginosa, Enterobacter, Staph saprophyticus, enterococcus, Group B strep.
**Incidence:** 1-2% of pregnancies. Right kidney 75%, left kidney 10%, bilateral 15%.
**Management:**

Bedrest in semi Fowler's position on side opposite affected kidney. Cooling measures prn temperature >102 degrees. IV hydration. Strain urine for stones.

IV antibiotics until afebrile 48h and costovertebral angle tenderness resolved, then change to PO to complete 7-10 days; may follow with prophylaxis. Urine C and S available 24-48 hours after initiation of antibiotics.

Cefazolin (Ancef) 1-2 gm IVPB q8h **OR**
Ampicillin/sulbactam (Unasyn) 1.5-3 gm IVPB q6h **OR**
Ampicillin 2 gm IVPB q4-6h **AND CONSIDER ADDING**
Gentamicin 120 mg (2 mg/kg) IVPB then give 80 mg (1.5 mg/kg) IV q8h (5 mg/kg/d in 3 doses) **OR**
Aztreonam (Azactam) 2 gms IV q6-8h

**After Discharge:**

Nitrofurantoin monohydrate (Macrobid) 100 mg PO bid x 7-10 days **OR**
Macrodantin 100 mg PO qid x 7-10 days, then 100 mg PO qhs until 6 weeks postpartum (if recurrent) **OR**
Cephalexin (Keflex) 500 mg PO qid x 7-10 days.

## Trauma During Pregnancy

Trauma is the leading cause of nonobstetric death in women of reproductive age, and 6-7% of all pregnancies are complicated by some type of trauma.

## I. Mechanism of Injury

### A. Blunt Abdominal Trauma

1. Blunt abdominal trauma secondary to motor vehicle accidents is the leading cause of nonobstetric-related death during pregnancy, followed by falls and assaults (including domestic violence).
2. The blood supply to the pelvic organs is greatly increased during pregnancy, and the enlarged uterus is more susceptible to injury. Uterine rupture or laceration, retroperitoneal hemorrhage, renal injury and upper abdominal injuries are possible. Bowel injuries are less common because the enlarged uterus displaces and protects the intestines.
3. Abruptio placentae occurs in 40-50% of patients with major traumatic injuries and in up to 5% of patients with minor injuries.
4. **Clinical Findings in Blunt Abdominal Trauma:** Vaginal bleeding, uterine tenderness, uterine contractions, fetal tachycardia, late decelerations, fetal acidosis, and fetal death.
5. **Detection of Abruptio Placentae**
   a. In the trauma patient who is beyond 20 weeks of gestation, electronic monitoring can detect uterine contractile activity.
   b. The presence of vaginal bleeding and tetanic or hypertonic contractions is presumptive evidence of abruptio placentae.
6. **Uterine Rupture**
   a. Uterine rupture is an infrequent but life-threatening complication of trauma, accounting for only 0.6% of all injuries during pregnancy.
   b. Rupture usually occurs when there is direct abdominal impact associated with substantial force.
   c. Findings of uterine rupture range from subtle (uterine tenderness, nonreassuring fetal heart rate pattern), without changes in maternal vital signs, to rapid onset of maternal hypovolemic shock and death.
7. **Direct Fetal Injury**
   a. Direct fetal injury is an infrequent complication of blunt trauma during pregnancy.
   b. The most common mechanism of fetal head injury involves simultaneous fracture of the maternal pelvis in late gestation when the fetal head is engaged.
   c. The fetus is more frequently indirectly injured as a result of hypoxia from blood loss or abruption.
   d. In the first trimester the uterus is not an abdominal organ; therefore, it is unlikely for trauma to cause miscarriage in the first trimester.

### B. Penetrating Trauma

1. Gunshot and stab wounds make up most types of penetrating abdominal trauma.
2. Penetrating abdominal trauma during pregnancy has a poor prognoses. Visceral injuries to the mother complicate only 19% of gunshot wounds to the uterus, whereas the fetus is injured nearly two-thirds of the time. Perinatal mortality is 41-71%. Maternal mortality is less than 5 %.

## II. Minor Trauma in Pregnancy

**A. Clinical Evaluation**

1. Pregnant patients who sustain seemingly minimal trauma require a systematic evaluation to exclude significant injuries. Common "minor" trauma includes falls, especially in the third trimester, blows to the abdomen or low-velocity motor vehicle accidents ("fender benders").
2. **History**
   a. The patient should be questioned about seat belt use, loss of consciousness, any pain, vaginal bleeding or rupture of membranes, and fetal movement.
   b. Lap and shoulder belts are recommended for pregnant patients while driving; however, use of only the lap belt can cause compression of the uterus against the sacrum, resulting in an increase in intrauterine pressure, which can shear the placenta from the uterine wall.
3. **Physical Exam**
   a. A complete physical examination should be performed, with attention focused on the upper abdominal pain (indicative of liver or spleen damage), flank pain (renal trauma), uterine pain (placental abruption or uterine rupture), and pain over the symphysis pubis (pelvic fracture, bladder laceration, fetal skull fracture).
   b. A search for orthopedic injuries should also be completed.

**B. Management of Minor Trauma**

1. The minor trauma patient with a fetus that is less than 20 weeks gestation (not yet viable) and no significant injury can be safely discharged after documentation of the fetal heart rate. Patients with potentially viable fetuses (over 20 weeks of gestation) should be taken to the labor unit for fetal monitoring, laboratory tests and ultrasonographic evaluation.
2. A complete blood count, urinalysis (to rule out hematuria), blood type and screen (to check Rh status) and coagulation panel, including measurement of prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen and fibrin split products, should be obtained. The coagulation panel is useful if any suspicion of abruption exists, especially in patients with abdominal bruising, pain or vaginal bleeding.
3. **The Kleihauer-Betke (KB) Test**
   a. This test detects fetal red blood cells in the maternal circulation. A KB stain should be obtained routinely for any pregnant trauma patient whose fetus is over 12 weeks of gestational age (when the uterus becomes an abdominal organ).
   b. Regardless of the patient's blood type and Rh status, the KB test can help determine if fetomaternal hemorrhage has occurred.
   c. The KB test also can be used to determine the amount of Rho(D) immunoglobulin (RhoGAM) required in patients who are Rh-negative.
   d. A positive KB stain indicates uterine trauma, and any patient with a positive KB stain should be observed closely, with at least 24 hours of continuous fetal monitoring and performance of a coagulation panel. However, serial KB stains are not particularly helpful.
4. Ultrasonography is less sensitive for diagnosing abruption than is the finding of uterine contractions on tocodynamometry. Absence of sonographic evidence of abruption does not exclude with certainty the presence of an abruption.
5. Patients with abdominal pain, significant bruising, vaginal bleeding,

rupture of membranes or uterine contractions should be admitted to the hospital for overnight observation and continuous fetal monitoring. These patients may require 48 hours or more of monitoring.

6. Uterine contractions and vaginal bleeding are suggestive of abruption. Even if vaginal bleeding is absent, the presence of contractions is still a concern, since the uterus can contain up to 2 L of blood from a "concealed" abruption.
7. Trauma patients experiencing no contraction activity, usually do not have abruption, while patients with greater than one contraction per 10 minutes (six per hour) have a 20% incidence of abruption within the first four hours after presentation.
8. In minor trauma patients with no evidence of minimal trauma and no uterine contractions, no rupture of membranes, no bleeding or pain, 4-6 hours of monitoring is probably adequate. Patients without contractions or bleeding who have been monitored for 4-6 hours and who are being discharged should be advised to return immediately if contractions increase to more than 6 per hour or if vaginal bleeding or abdominal pain develops, since these events may signal an abruption.
9. **Management of Preterm Labor After Minor Trauma**
   - **a.** It is often difficult to determine whether the patient with regular uterine contractions has preterm labor, an abruption, or both since blood from an abruption can irritate the uterus and cause contractions.
   - **b.** If no cervical change is apparent, tocolytic therapy is usually unnecessary.
   - **c.** If documented preterm labor exists and the gestational age of the fetus suggests possible pulmonary immaturity, tocolysis should be considered.
   - **d.** Tocolysis with magnesium sulfate is preferable to beta agonists such as ritodrine or terbutaline, since beta agonists may cause significant tachycardia and mask hypovolemia, or they may mask contractions, the most sensitive indicator of abruption.

## III. Major Trauma in Pregnancy

**A.** Initial evaluation of major abdominal trauma in pregnant patients does not differ from evaluation of abdominal trauma in a nonpregnant patient.

**B. Maintain an airway**, ensuring adequate breathing and adequate circulatory volume. Two large-bore (14-16-gauge) intravenous lines are placed.

**C. Oxygen** should be administered by nasal cannula, mask, or endotracheal intubation. A pulse oximeter or arterial blood gas determinations can be used to evaluate maternal oxygen saturation, which should be kept at greater than 90% (approximately equal to an oxygen partial pressure [pO2] of 60 mm Hg).

**D. Circulatory Volume Resuscitation**

1. Crystalloid in the form of lactated Ringer's or normal saline should be given as a 3:1 replacement for the estimated blood loss over the first 30-60 minutes of acute resuscitation.
2. Massive trauma may require the use of blood products for resuscitation. O-negative packed red cells are preferred if emergent blood is needed before the patient's own blood type is known.
3. The use of vasopressors to restore maternal blood pressure should be avoided until appropriate volume replacement has been administered.
4. A urinary catheter should be placed to measure urine output and

observe for hematuria.

**E. Deflection of the uterus** off the inferior vena cava and abdominal aorta can be achieved by placing the patient in the lateral decubitus position. If the patient must remain supine (because of spinal trauma or cardiopulmonary resuscitation), manual deflection of the uterus to the left with a hand and placement of a wedge under the patient's hip or backboard will tilt the patient.

**F. Secondary Survey:** Following stabilization, a more detailed secondary survey of the patient, including fetal evaluation, is performed. All body regions are thoroughly examined especially the abdomen. The uterus is examined for gross deformity, tenderness, irritability or contractions.

**G. Diagnosis of Intraperitoneal Hemorrhage**

1. Open peritoneal lavage with sharp dissection and opening of the anterior abdominal peritoneum under direct vision, usually periumbilically, is recommended over blind needle insertion.
2. **Indications for Peritoneal Lavage Following Trauma During Pregnancy**

   Abdominal signs or symptoms suggestive of intraperitoneal bleeding
   Altered sensorium
   Unexplained shock
   Major thoracic injuries
   Multiple major orthopedic injuries
3. Peritoneal lavage is unnecessary if clinically obvious intraperitoneal bleeding is present.

**H.** Pregnancy should not substantially alter treatment of nonobstetric-related injuries, and radiography is not contraindicated in trauma patients who are pregnant. Neither magnetic resonance imaging (MRI) nor computed tomography (CT) is contraindicated in pregnant patients, although MRI is probably safer since it does not require ionizing radiation.

**I. Baseline laboratory data** in patients with major abdominal trauma are the same as in patients with minor trauma, except that typing and crossmatching for packed red cells and arterial blood gas determinations, amylase and lipase levels, and serum chemistries may also be necessary.

**J. Penetrating Trauma**

1. These patients should be completely undressed, and all entrance and exit wounds should be carefully examined; victims are occasionally shot or stabbed multiple times.
2. Radiographs of the area in multiple projections are helpful to localize a bullet if an exit wound is not seen.
3. Exploratory laparotomy is necessary for all gunshot wounds to the abdomen and for all knife wounds that penetrate the abdominal wall.

**K. Cardiac Arrest**

1. Pregnancy should not alter the cardiac arrest protocol, except that the left tilt position is employed because it can have the benefit of substantially increasing pre-load and thus enhances cardiac output.
2. In cases of unsuccessful CPR, emergent perimortem cesarean section is performed in patients with potentially viable fetuses based on gestational age. Fetal survival is greatly enhanced if delivery is accomplished within four minutes of cardiac arrest when resuscitation fails.

**IV. Tetanus Prophylaxis:** The indications for tetanus prophylaxis are not changed in pregnancy, and tetanus prophylaxis, both toxoid and immunoglob-

ulin, should be given if indicated.

## V. Burns

**A.** If less than one-third of the body is involved, burns have little effect on pregnancy.

**B.** Minor bums should be treated in the usual manner, and patients with major burns are best referred to a burn center.

## VI. Electronic Monitoring

**A.** Electronic monitoring in trauma victims beyond 20 weeks of gestation is predictive of abruptio placentae. Placental abruption is unlikely in the absence of uterine contractions or with contractions at a frequency of less than 1 every 10 minutes after 4 hours of monitoring.

**B.** Monitoring should be initiated after the woman is stabilized. Further monitoring and management is required if uterine contractions, a nonreassuring fetal heart rate pattern, vaginal bleeding, significant uterine tenderness or irritability, serious maternal injury, or rupture of the amniotic membranes is present.

## VII. Fetal-Maternal Hemorrhage

**A.** The incidence of fetal-maternal hemorrhage is four- to fivefold higher in pregnant women who have experienced trauma.

**B.** Trauma may cause transfer of blood from the fetus to the mother, but the average amount transferred from the fetus to the mother is usually less than 15 mL, so the standard 300-ug dosage of Rho (D) immunoglobulin (1 ampule of RhoGAM), which provides protection against 30 mL of fetal blood, is adequate for almost all Rh-negative unsensitized patients.

**C.** The approximate amount of fetal blood present in the maternal circulation can be calculated by using results of the Kleihauer-Betke stain, and if the KB stain shows evidence of greater than 30 mL of hemorrhage, more D immunoglobulin should be given. (300 ug for each 30 mL of whole blood transfused)

**D.** Regardless of the outcome of the KB test, all Rh-negative patients who sustain abdominal trauma should receive at least one ampule of D immunoglobulin within 72 hours, since in up to 70 percent of cases as little as one to three fetal cells per 500,000 maternal cells can sensitize Rh-negative women.

**E.** Complications of fetal-maternal hemorrhage isoimmunization include fetal and neonatal anemia, fetal cardiac arrhythmias, and fetal death.

## VIII. Ultrasound

**A.** Ultrasonography following trauma during pregnancy is not as sensitive as cardiotocographic monitoring for diagnosing abruptio placentae.

**B.** Sonography may be useful for determining gestational age, placental localization, fetal well-being or demise, amniotic fluid volume, and may reveal the presence of intra-abdominal fluid from intraperitoneal hemorrhage.

## IX. Radiation Exposure

**A. Radiographic studies should be performed** for the evaluation of potentially serious injuries, regardless of fetal exposure. Standard radiography is more sensitive for fetalcranial damage than is ultrasound.

**B. The radiation dose** received by the lower abdomen is minimized by

shielding. It is unlikely that mutagenesis or teratogenesis occurs during single x-ray exposures with shielding.

C. **Abdominal-pelvic computed tomography (CT)** is superior for evaluation of blunt abdominal trauma because it can visualize extraperitoneal and retroperitoneal structures as well as the genitourinary tract.

## Chorioamnionitis

**History:** Fever, chills, uterine tenderness or contractions; premature or prolonged (>24h) rupture of membranes; malodorous amniotic fluid, multiple vaginal exams, internal monitors, recent amniocentesis. Decreased fetal movement.
**Physical:** Temperature >100.4°F, uterine tenderness, maternal/fetal tachycardia, hypotension, fetal distress; sterile speculum exam: foul smelling amniotic discharge.
**Incidence:** 0.5-1.0% of pregnancies. Neonatal sepsis risk is 1-5%
**Labs:** CBC, UA, blood C and S; amniocentesis for gram stain, C and S; cultures for GC, chlamydia, Group B Strep.
**Treatment:**
Consider delivery as soon as possible.
Ampicillin 2 gm IV q4-6h **OR**
Ceftizoxime (Cefizox) 1-2 gm IV q8h **AND**
Gentamicin 120-140 mg (2 mg/kg) IV, then 80-120 mg (1.5 mg/kg) IV q8h (5 mg/kg/d) **OR**
Aztreonam (Azactam) 2 gms IV q6-8h.

## Asthma

**History:** Wheezing, cough, dyspnea, sputum, fever; frequency and severity of attacks.
**Physical:** Tachypnea, labored breathing; fever, lethargy, nasal flaring, accessory muscles use, wheeze, retractions.
**Incidence:** Asthma occurs in 1% of pregnancies.
**Differential Diagnosis:** Bronchitis, heart failure, pulmonary embolism, upper airway obstruction, pneumonia.
**Labs:** ABG, CBC, SMA7; CXR, PA and LAT; PPD.
**Treatment:**
Oxygen at 2-6 L/min by NC or mask, ECG monitor. Consider intubation and mechanical ventilation if pCO2 >40 mmHg or pO2 <60 mmHg with oxygen saturation <90%.
D5LR or D5 1/2 NS at 125-150 ml/h.
**Beta Agonists:**
Albuterol (Ventolin) 0.5 ml in 3 ml NS q2-6h or MDI 2 puffs q4-6h **OR** other inhaled beta agonist, 2 puffs q4h as needed.
**Corticosteroids and Cromolyn:**
Methylprednisolone (Solu-Medrol) 1-2 mg/kg or 40-125 mg IV q4-6h **OR**
Hydrocortisone 100-250 mg IVPB q4-8h or 250 mg in 200 ml LR given as 4 mg/kg loading, then 0.5 mg/kg/h; patients beginning labor or C-section who have had recent steroids should receive 100 mg IV/IM q8h x 24h **OR**
Prednisone 40 mg PO qd x 1 week, then taper for one week **OR**

Beclomethasone (Beclovent) 2-4 puffs bid-qid.
Cromolyn Sodium (Intal) 2 puffs qid

**Aminophylline and Theophylline:**

Aminophylline loading, 5-6 mg/kg in 250 cc D5W IV over 20-30min; decrease loading dose to 2.8 mg/kg if already taking theophylline.

Aminophylline maintenance 0.5-0.7 mg/kg/h (500 mg in 250 cc of D5W). Level after 2-4h infusion (1.25 mg/kg will increase serum level by 2 mcg/ml)(therapeutic levels 10-20).

# Diabetes in Pregnancy

Diabetes mellitus is the most common medical complication of pregnancy. Approximately 2-3% of pregnancies are affected by diabetes; 90% of these cases represent gestational diabetes mellitus (GDM).

## I. Classification

**A.** Pregestational diabetes is classified as Type I (insulin-dependent) or Type II (non-insulin-dependent) according to whether the patient requires exogenous insulin.

**B.** Gestational diabetes is carbohydrate intolerance first recognized during pregnancy. If the abnormality persists after delivery, the patient's diagnosis is revised to Type I or Type II diabetes.

## II. Pregestational Diabetes

**A.** Patients with pregestational diabetes have been diagnosed with diabetes prior to pregnancy.

**B.** There is a fourfold increase in the incidence of major congenital malformations in the offspring of women with pregestational diabetes that is related to poor control of diabetes during embryogenesis. A significant reduction in the fetal malformation rate occurs in women whose diabetes is tightly controlled during the period of organogenesis.

**C.** Pregnancy has been associated with a greater than twofold risk for the progression of diabetic retinopathy. Proliferative retinopathy may lead to vision loss if untreated and thus it should be monitored and managed with photocoagulation.

**D.** Diabetic women should be evaluated before pregnancy by means of a history, physical examination, ophthalmologic evaluation, and 24-hour urine collection for measurement of creatinine clearance and protein excretion. If this evaluation has not been accomplished before pregnancy, it should be done as early in pregnancy as possible during pregnancy.

**E.** Measurement of glycosylated hemoglobin, including hemoglobin A1c, can be used to assess prior control of diabetes.

## III. Metabolic Control of Pregestational Diabetes

**A.** Maternal hyperglycemia leads to fetal hyperglycemia and fetal hyperinsulinemia, which may cause fetal macrosomia and fetal death and delayed pulmonary maturation.

**B.** Diabetic women should attempt to achieve and maintain euglycemia throughout pregnancy.

**C.** Glucose levels are measured by the patient with a portable glucose meter and recorded in a log book several times daily, fasting and preprandial (before each meal).

**D. Therapeutic objectives in pregnancies complicated by diabetes mellitus:**

1. **Fasting:** 60-90 mg/dL
2. **Before lunch, dinner, or bedtime snack:** 60-105 mg/dL
3. **After meals:** (1 hour) no higher than 130-140 mg/dL (2 hours) no higher than 120 mg/dL
4. **From 2 AM to 6 AM:** 60-90 mg/dL

**E.** The average caloric intake should range from 2,200 to 2,400 kcal, with protein accounting for 12-20% of total energy intake, carbohydrate for 50-60%, and fat making up the remainder. Nutritional counseling is initiated in early pregnancy.

**F. Insulin Therapy**

1. Control of maternal glycemia usually can be achieved with multiple daily injections of insulin and adjustment of dietary intake. Oral hypoglycemic agents are not used during pregnancy, as these drugs may reach the fetus and produce fetal hyperinsulinemia.
2. Most patients require a combination of both intermediate-acting and short-acting (regular) human insulin in the morning and evening. An alternative regimen for the evening is to administer separate injections of short-acting insulin at dinnertime and intermediate-acting insulin at bedtime to reduce the frequency of nocturnal hypoglycemia.
3. Patients and their families should be instructed on the treatment of hypoglycemia, including the use of glucagon.

## IV. Fetal Evaluation

**A.** Maternal serum alpha-feto-protein levels at 16-20 weeks of gestation is used in association with an ultrasound study at 18-20 weeks in an attempt to detect neural tube defects and other anomalies.

**B. Antepartum fetal surveillance**

1. During the third trimester, when fetal death is most likely to occur, a program of fetal surveillance is initiated.
2. Maternal monitoring of fetal activity (kick counts) is often used as an adjunct to some form of antepartum testing.
3. The timing and frequency of nonstress testing, biophysical profile, or contraction stress test depend on the degree of risk present. In complicated pregnancies, testing may be initiated at 28 weeks.
4. Testing may be started considerably later in gestation for a patient whose condition has been well controlled, who does not have vascular disease, and whose fetus demonstrates normal growth on several ultrasound examinations.

## V. Delivery Considerations

**A. Timing of Delivery**

1. If a patient has maintained excellent glycemic control and fetal surveillance has remained normal, she may await the spontaneous onset of labor.
2. For highest risk patients, with vascular disease, poor metabolic control, problems with compliance, or a previous stillbirth, the timing of delivery is based on clinical factors, with the goal being to reach documented pulmonary maturity.
3. Significant maternal hypertension, fetal growth delay, or worsening retinopathy may mandate preterm delivery.
4. Prior to elective delivery, patients with poor or undocumented meta-

bolic control or those at less than 39 weeks of gestation by accurate gestational dating should undergo amniocentesis to document fetal pulmonary maturity.

   a. With a mature L/S ratio, a low incidence of respiratory distress syndrome can be expected in women whose pregnancies are complicated by well-controlled diabetes. If chemical tests do not confirm lung maturity, delivery may be postponed and a repeat amniocentesis may be planned.
   b. When antepartum testing is nonreassuring and tests indicate lung maturity, the fetus should be delivered. If amniotic fluid analysis does not confirm maturity, the risks to the fetus of remaining in utero is weighed against the risks of premature delivery.

5. If premature labor occurs, tocolytic therapy with parenteral beta-sympathomimetic agents are avoided because they may significantly worsen maternal glucose control. Magnesium sulfate is the preferred IV tocolytic for women with diabetes mellitus.

## VI. Management of Intrapartum Diabetes

### A. Insulin Therapy During Labor

1. In patients with well-controlled diabetes who are scheduled for elective induction of labor, the usual dose of insulin is given at bedtime, and morning insulin is withheld.
2. Once active labor begins, a constant infusion of dextrose is given to supply caloric needs.
3. Short-acting insulin is added if the patient becomes hyperglycemic.
4. Capillary glucose values are determined at the bedside every 1-2 hours. If rapid intravenous infusion of fluid is necessary, dextrose is avoided because of the risk of fetal acidemia.

**Low-dosage Constant Insulin Infusion for the Intrapartum Period**

| Blood Glucose (mg/100 ml) | Insulin Dosage (U/h) | Fluids (125 ml/h) |
|---|---|---|
| < 100 | 0 | Dextrose/Lactated Ringer's solution |
| 100-140 | 1.0 | Dextrose/Lactated Ringer's solution |
| 141-180 | 1.5 | Normal saline |
| 181-220 | 2.0 | Normal saline |
| >220 | 2.5 | Normal saline |

Dilution is 25 U of regular insulin in 250 ml of normal saline with 25 ml flushed through line administered intravenously.

### B. Elective Cesarean delivery

1. Cesarean delivery should be performed if the estimated weight is greater than 4,500 g.
2. **Insulin Therapy for Cesearean Delivery**
   a. Elective cesarean delivery is scheduled for early morning. The usual morning insulin dose is withheld, and glucose levels are

monitored frequently. Regular insulin is given if necessary.

**b.** After delivery, intravenous dextrose is given and glucose levels are checked every 4-6 hours.

**c.** To avoid postpartum maternal hypoglycemia, the antepartum objective of tight metabolic control is relaxed. Short-acting insulin is administered only for significant hyperglycemia at levels above 200 mg/dL.

**d.** Once the patient begins a regular diet, subcutaneous insulin can be reinstituted at dosages substantially lower than those given in the third trimester. It is helpful if the pregestational dose is known.

## VII. Screening and Diagnosis of Gestational Diabetes

**A.** Gestational diabetes mellitus has been characterized as the onset or recognition of glucose intolerance during pregnancy. Patients with GDM have about a 50% likelihood of developing diabetes mellitus within 20 years.

**B.** Screening for gestational diabetes mellitus GDM is performed with a 50-g oral glucose load followed by a glucose determination 1 hour later.

**C.** Screening is performed between 24 and 28 weeks of gestation. Some women who are at high risk for gestational diabetes merit special attention and also may need earlier intervention:

1. Obese or overweight
2. Family history of diabetes
3. Prior miscarriages or stillbirths without a specific reason
4. Prior macrosomia of 9 lb or more
5. Gestational diabetes in a previous pregnancy
6. Hypertension and/or hyperlipidemia
7. Prior baby with anomalies
8. 30 years old or more.
9. Testing in these patients is done during the first visit. However, testing should be done without delay, irrespective of the duration of pregnancy, if a patient has symptoms or signs suggestive of diabetes. These include polyuria, nocturia, polydipsia, recurrent vaginal infections, and failure to gain expected weight. If screening in early pregnancy yields a normal result, subsequent testing is performed at 24-28 weeks.

**D. Glucose challenge**

1. 50-g oral glucose load is given to patient in office (time of day is not important)
2. Venipuncture (not capillary) specimen is drawn 1 hr after glucose load is administered
3. Plasma glucose value in excess of 140 mg/dL is positive and strongly suggests gestational diabetes; these patients should next be evaluated by a formal oral glucose tolerance test

**E. Three-hour oral glucose tolerance test**

1. Test is done in morning, after overnight fast
2. After specimen is drawn to determine fasting glucose level, patient is given 100 g of glucose orally
3. Positive test is indicated when two or more of following venous plasma values are equaled or exceeded:

| | |
|---|---|
| Fasting | 105 mg/dL |
| 1 hr | 190 mg/dL |

| | |
|---|---|
| 2 hr | 165 mg/dL |
| 3 hr | 145 mg/dL |

**VIII. Management of Gestational Diabetes**

**A.** Following diagnosis, patients are placed on a diet such as that prescribed for preexisting diabetes in pregnancy.

**Dietary Strategies for Women with Gestational Diabetes: Daily Caloric Requirements**

| Current Weight in Relation to ideal Body Weight | Daily Caloric Intake (kcal/kg) |
|---|---|
| <80% | 35-40 |
| 80-120% | 30 |
| 120-150% | 24 |
| >150% | 12-15 |

**B.** Fasting and postprandial glucose levels are monitored at least weekly.

**C.** Insulin therapy is recommended when dietary management does not maintain the fasting plasma glucose at less than 105 mg/dL or the 2-hour postprandial plasma glucose at less than 120 mg/dL. Patients who require insulin should monitor their glucose levels daily.

**D.** Patients with GDM whose condition is well controlled are at low risk for fetal death.

**E.** Those whose condition is not well controlled or who require insulin therapy are managed in the same manner as those with pregestational diabetes. In women with well-controlled gestational diabetes, weekly biophysical fetal testing as early as 34 weeks of gestation. More intensive biophysical fetal testing is recommended in patients: who require insulin, those with hypertension, and those with a history of previous stillbirth.

**F.** Because women with GDM are at increased risk for overt diabetes, follow-up testing is recommended during the first few months following delivery and thereafter on a yearly basis. Diabetes is diagnosed if the fasting plasma glucose is greater than or equal to 140 mg/dL.

# Diabetic Ketoacidosis

**I. Clinical Presentation**

**A.** Diabetes is newly diagnosed in 20% of cases of diabetic ketoacidosis. The remainder of cases occur in known diabetics in whom ketosis develops after a precipitating factor, such as infection.

**B. Symptoms of DKA:** Polyuria, polydipsia, fatigue, nausea, and vomiting developing over 1 to 2 days. Abdominal pain is prominent in 25%.

**C. Physical Exam:**

**1.** Patients are typically flushed (despite hypotension) and tachycardiac. Tachypnea is common; Kussmaul's respiration, with deep breathing and air hunger, occurs when serum pH is between 7.0 and 7.24.

**2.** A fruity odor on the breath indicates the presence of acetone, a by-product of diabetic ketoacidosis.

**3.** Fever is seldom present even though infection is common. Hypothermia may occur.

**4.** 80% of patients with diabetic ketoacidosis have altered mental status.

Most are awake but confused; 10% are comatose.

**D. Laboratory Findings:**

1. Serum glucose level >250 mg/dL
2. pH <7.35
3. Bicarbonate level below normal with an elevated anion gap,
4. Presence of ketones in the serum

## II. Differential Diagnosis

**A.** Diabetic ketoacidosis must be differentiated from other causes of ketosis, acidosis, and hyperglycemia.

**B. Differential Diagnosis of Ketosis-Causing Conditions:**

1. Ketosis may result from alcoholic ketoacidosis or starvation. The majority of patients with alcoholic ketoacidosis do not have diabetes, and the serum glucose level is not elevated. Alcoholic ketoacidosis occurs with heavy drinking and vomiting.
2. Starvation ketosis occurs after 24 hours without food and is not usually confused with diabetic ketoacidosis because glucose and serum pH are normal.

**C. Differential Diagnosis of Acidosis-Causing Conditions:**

1. Metabolic acidoses are divided into increased anion gap (>14 mEq/L) and normal anion gap (anion gap is determined by subtracting the sum of chloride plus bicarbonate from sodium).
2. All ketoacidoses increase the anion gap (DKA, lactic acidosis, uremia, poisoning from salicylates or methanol).
3. Acidoses without an increased anion gap are associated with a normal glucose level and absent serum ketones. Acidoses that do not increase the anion gap are caused by renal or gastrointestinal electrolyte losses.

**D. Hyperglycemia Caused by Hyperosmolar Nonketotic Coma:**

1. Causes severe hyperglycemia that must be distinguished from DKA. Patients are usually elderly and have type II diabetes and a precipitating illness.
2. Serum glucose level is markedly elevated (>600 mg/dL), and osmolarity is increased. In hyperosmolar coma, ketosis is minimal. Patients may be acidotic from lactic acidosis and renal failure resulting from dehydration.
3. Treatment of hyperosmolar, nonketotic coma consists of hydration and potassium replacement. Administration of insulin is less important and should be begun after fluid resuscitation is under way.

## III. Treatment of Diabetic Ketoacidosis

**A. Fluids**

1. Fluid deficits average 5 L (50 to 100 mL/kg).
2. Give 1 liter of normal saline solution in the first hour and the second liter over the second and third hours. Thereafter, ½ normal saline solution should be infused at 250-500 mL/h. These rates are lower than recommended in the past, because lower rates cause fewer electrolyte abnormalities.
3. Higher rates of fluid administration may be required in patients who are extremely dehydrated.
4. Lower rates are indicated for patients with chronic renal failure because they have not had major fluid losses.

5. When the glucose level reaches 250 mg/dL, 5% dextrose should be added to the replacement fluids to prevent hypoglycemia. If the glucose level declines rapidly, 10% dextrose should be used.

**B. Insulin**

1. Insulin 0.1 U/kg IV bolus, followed by an infusion of 0.1 U/kg per hour. The biologic half life of IV insulin is less than 20 minutes, so an IV bolus without a follow-up infusion has a very short-lived effect, and serum glucose will rise rapidly if the insulin infusion is discontinued.

## IV. Monitoring of Therapy

**A.** The serum bicarbonate level and anion gap should be monitored to determine the effectiveness of insulin therapy.

**B.** Follow-up evaluation of acidosis, not just of glucose level, is very important because in some patients glucose levels may normalize early in therapy, but the acidosis takes longer to resolve. Continued insulin infusion is needed to resolve the acidosis.

**C. Glucose Levels**: Check glucose level at 1-2 hour intervals during IV insulin administration

**D. Electrolyte Levels:** Assess q2h for first 6-8 h and then q4h

**E.** Use a flow sheet to record of intravenous fluid administration, insulin infusion rate, urine output, glucose and electrolyte levels, and anion gap.

**F.** Phosphorus and magnesium levels should be checked after about 4 hours of treatment, and replacement therapy should be started if they are significantly below normal.

**G.** Testing for plasma and urine ketones is helpful in diagnosing diabetic ketoacidosis, but is not necessary during therapy.

**H.** When the bicarbonate level is greater than 16 mEq/L and the anion gap is less than 16 mEq/L, the insulin infusion rate should be decreased by half. However, if the bicarbonate level is not rising and the anion gap is not falling after 2 hours of treatment, the insulin infusion rate should be doubled.

## V. Potassium

**A.** The most common preventable cause of death in patients with DKA is hypokalemia. Deficits are caused by osmotic diuresis and cellular shifts. The typical deficit is between 300 and 600 mEq.

**B.** Replacement therapy with potassium chloride should be started when fluid therapy is started. In most patients, the initial rate of potassium replacement is 20 mEq/h, but those with hypokalemia need more aggressive replacement (40 mEq/h) and monitoring.

**C.** All patients should receive potassium replacement, except for those with known chronic renal failure, no urine output, or an initial serum potassium level greater than 6.0 mEq/L.

## VI. Determination of Underlying Cause

**A.** Infection is the underlying cause of diabetic ketoacidosis in about 50% of cases. Infection of the urinary tract, skin, sinuses, or teeth should be sought. Fever is unusual in diabetic ketoacidosis and indicates infection when present; an elevated white blood cell count is usually present whether or not there is infection.

**B.** Physical examination, chest film, and urinalysis should be completed to exclude infection. If infection is suspected, antibiotics should be started empirically.

**C.** Omission of insulin doses (common in adolescents) is often a precipitating factor.

**D.** Patients using a subcutaneous insulin pump can become ketotic within hours if the pump becomes disconnected.

**E.** Myocardial infarction, cerebrovascular accident, and abdominal catastrophes may precipitate DKA.

## VII. Sodium

**A.** Patients with diabetic ketoacidosis often have a low serum sodium level, because the high level of glucose has a dilutional effect. For every 100 mg/dL that glucose is elevated, the sodium level should be corrected upward by 1.6 mEq/L.

**B.** Rarely, patients have an initial serum sodium greater than 150 mEq/L, indicating severe dehydration. Initial rehydration fluid should consist of 50% normal saline.

## VIII. Phosphate

**A.** Diabetic ketoacidosis depletes phosphate stores.

**B.** Serum phosphate level should be checked after 4 hours of treatment. If it is below 1.5 mg/dL, potassium or sodium phosphate should be added to the IV solution.

## IX. Bicarbonate

**A.** Administration of bicarbonate is ineffective in diabetic ketoacidosis, even in severely acidotic patients.

**B.** Bicarbonate administration may exacerbate hypokalemia and cause a paradoxic intracellular acidosis, a negative shift in the oxygen dissociation curve, and late alkalemia.

## X. Additional Therapies

**A.** A nasogastric tube should be inserted in semiconscious patients to protect against aspiration.

**B.** Deep vein thrombosis prophylaxis should be provided for patients who are elderly, unconscious, or severely hyperosmolar; subcutaneous heparin, 5,000 U every 8 hours.

## XI. Initiation of Subcutaneous Insulin

**A.** When the serum bicarbonate level is normal and the patient is ready to eat, subcutaneous insulin can be started.

**B.** It is critical to overlap intravenous and subcutaneous administration of insulin to avoid redevelopment of ketoacidosis. The intravenous infusion may be stopped 1 hour after the first subcutaneous injection of regular insulin.

**C. Estimation of Subcutaneous Insulin Requirements:**

1. Multiply the final insulin infusion rate times 24 hours and divide the total into morning and evening doses.
2. Two thirds of the total dose is given in the morning, as two thirds NPH and one third regular insulin. The remaining one third of the total dose is given before supper as one half NPH and one half regular insulin.
3. Adjust subsequent doses according to the patient's blood glucose response.

**XII. Complications**

**A.** Death from diabetic ketoacidosis can be caused by hypokalemia, untreated infection, aspiration, thromboembolism, cerebral edema, and myocardial infarction.

**B.** The glucose level should be carefully monitored as it declines to avoid hypoglycemia.

**C.** Excessive use of normal saline solution can result in fluid overload and hypernatremia.

**D.** Cerebral edema occurs in 1 of 200 patients with diabetic ketoacidosis, usually in those younger than age 20. It is manifested by abrupt worsening of the mental status. Patients should be treated aggressively with dexamethasone and mannitol.

## Premature Rupture of Membranes

**Definitions:**

**Premature rupture of membranes:** Rupture of membranes prior to the onset of labor.

**Prolonged rupture of membranes:** Rupture of membranes for greater than 24 hours.

**History:** Time of rupture, color, odor, quantity of fluid; trauma, fever; coitus, fetal movement; prenatal care history.

**Physical:** Temperature, maternal tachycardia, uterine tenderness; avoid digital examination. Sterile speculum exam for pooled amniotic fluid for ferning, nitrazine; visually examine cervix dilatation, effacement; fetal heart tones.

**Etiologies:** Amnionitis, cervicitis, group B strep colonization, polyhydramnios, multiple gestation, fetal anomalies, incompetent cervix, abruptio placentae, amniocentesis, idiopathic.

**Complications:** Cord prolapse/compression, preterm labor, sepsis, intraventricular hemorrhage, limb contractures.

**Incidence** Premature rupture of membranes occurs in 8% of term pregnancies. 30% of preterm deliveries. 90% of term and 50% of preterm patients are in labor < 24 hours with premature rupture of membranes. 85% preterm and 50% previable (<25 weeks) patients are in labor < one week.

**Labs:** GC, chlamydia; group B strep cultures of introitus. Vaginal pool fluid for phosphatidylglycerol (< 37 wks), UA, C and S, drug screen, CBC 2 times per week; ultrasound to assess fetal position and fluid index. Consider amniocentesis for gram stain and amniotic fluid culture.

**Management:**

Critically important to establish exact gestational age. No cervical exams, bedrest. Perform NST qd, fetal heart tones q8h.

**Corticosteroid Therapy:**

Initiate therapy between 24-34 weeks gestational age unless there is evidence of clinical chorioamnionitis. Corticosteroids accelerate fetal maturation and decreases risk of respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, and mortality in preterm newborns.

Betamethasone (Celestone) 12 mg IM q24hours x 2 doses **OR**
Dexamethasone (Decadron) 6 mg IM q6hours x 4 doses.

**<30 weeks:** Expectant management. If febrile, perform amniocentesis for gram

stain C and S. If gram positive cocci in chains and suspected chorioamnionitis: Induce labor and initiate antibiotic therapy. Consider vitamin K 10 mg IM q 1 week if EGA 28-32 weeks.

**30-35 weeks:** Perform amniocentesis for gram stain, C and S, lecithin/sphingomyelin ratio (>2 indicates maturity), phosphatidylglycerol (positive test indicates maturity). Manage expectantly; observe for chorioamnionitis; 1 hour NST qd and amniotic fluid index. If suspect chorioamnionitis, induce labor and initiate antibiotic therapy. Consider vitamin K 10 mg IM q 1 week if EGA 28-32 weeks. Consider prophylactic antibiotics.

**<36 weeks with contractions:** Perform amniocentesis or vaginal pool for lung maturity tests. If amniocentesis gram stain and C and S are negative, and lung profiles are immature, provide expectant management. Induce labor if mature lung profile studies. If chorioamnionitis occurs, induce labor and give antibiotic therapy.

**>36 weeks:** Assess fetal lung maturity, and manage expectantly until mature, then induce labor.

**Empiric Antibiotic Therapy and Group B strep Cervix Colonization:**

Ampicillin 1-2 g IV q6h or 500 mg PO q6h until cultures negative or if colonization, treat for 10 days **OR**

Erythromycin 250-500 mg PO qid.

**Antibiotic Therapy for Chorioamnionitis:**

Ampicillin 2 gm IV q4-6h **AND**

Gentamicin 100 mg (2 mg/kg) IV load, then 100 mg (1.5 mg/kg) IV q8h (5 mg/kg/d) **OR**

Aztreonam (Azactam) 2 gms IV q6-8h

## Preterm Labor

**Definition:** Labor occurring after 20 weeks and before 37 weeks gestational age.

**Incidence:** Preterm labor occurs in 8-10% of births. Causes 60% of neonatal morbidity/mortality.

**History:** Frequency of contractions. Spotting, bloody show; back or abdominal pain, rupture of membranes. Trauma, activity, intercourse, drug abuse, UTI symptoms. Fetal movement.

**Risk factors:** 50% of preterm births occur in women with no risk factors. Prior preterm delivery, multiple gestation, ≥3 first-trimester abortions, previous second-trimester abortions, maternal infection, incompetent cervix, uterine abnormalities (leiomyomata, septa), diethylstilbestrol (DES) exposure, placenta previa, premature placental separation (spontaneous or secondary to drug abuse), fetal abnormality, hydramnios, second-trimester bleeding, cervical effacement/dilatation (>50% or >1-2 cm), pregnancy weight <100 lbs, single parent, ≤16 years old, strenuous work, no prenatal care, chlamydia, group B strep.

**Physical:** Contractions q5min with cervical change, or cervical change ≥2 cm and/or ≥80% effacement on repeat exams within 12-24h. Temperature, pulse, fetal heart rate; sterile speculum exam for pooling, nitrazine, ferning; decreased amniotic fluid index.

**Differential Diagnosis of Preterm Labor:** Idiopathic preterm labor, Braxton Hicks (false labor), premature rupture of membranes, amnionitis, iatrogenic, incompetent cervix, uterine overdistension, multiple gestation, polyhydramnios, macrosomia, placental insufficiency, uterine anomalies, placental abruption or

previa, trauma.

**Labs:** UA, toxicology screen, ultrasound, CBC, GC, chlamydia, group B strep, SMA 7; amniocentesis for gram stain, C and S, Lecithin/sphingomyelin ratio, phosphatidylglycerol.

**Management:**

1. Bed rest in the left lateral decubitus position. Minimize cervical exams. Initially continuous external monitoring of fetal status and uterine contractions. Confirm gestational age and estimated fetal weight by ultrasound. Perform appropriate laboratory studies.
2. Encourage PO or IV hydration such as 1 L of LR or NS wide open, then 150 cc/h of D5LR or D5 1/2 NS.
3. Give terbutaline 0.25 mg SC q2-3 hours x 2 doses if preterm labor; give terbutaline only if pulse <110 and no contraindications (heart disease, hypertension, diabetes, hemorrhage, ruptured membranes).
4. If stabilized on SC terbutaline, then consider changing to oral terbutaline 2.5-5 mg terbutaline PO q4h. If continued preterm labor, consider alternative tocolytics
5. Observe for infection: fever, tachycardia, fetal tachycardia, leukocytosis.
6. Daily NST and consider amniocentesis at 35-36 weeks to document fetal lung maturity.
7. Patient education on preterm labor precautions and pelvic rest.

**Tocolytics (indicated if healthy fetus, cervix <4 cm, gestation <35-36 but >20 wks, no bleeding and no contraindications):**

Terbutaline (Brethine) 0.25 mg SQ q1-3h if pulse <120 then change to 2.5-5 mg PO q2-6h (0.25 mg SQ = 2.5 mg PO) max of 30 mg/d; hold if maternal pulse >120 **OR**

Ritodrine (Yutopar) (150 mg in 500 cc D5NS) start at 50-100 mcg/min and increase by 50 mcg/min q10-20 min until labor stops or side effects occur. Maximum dose 350 mcg/min. Decrease rate by 50 mcg/min each hour to minimum of 100 mcg/min. Switch to oral therapy after 12-24 hours of successful tocolysis. Monitor hematocrit, potassium, and glucose. Oral ritodrine 10-20 mg q4-6h if pulse <120. Maximum dose 120 mg/day. **OR**

Magnesium Sulfate (40 grams of MgSO4 in 1,000 ml D5NS). Infuse 4 grams over 20 minutes followed by 2 gm/hr. Increase by 0.5-1.0 gm/hr q15-30 min and check serum magnesium levels (therapeutic level is 5-8 mg/dL, toxic effects occur <10 mg/dL). Check reflexes, respirations and urine output q1h and keep urine output >30 cc/h. After uterine contractions cease, decrease dose by 0.5-1.0 gm/hr to a minimum of 2 gm/hr. Switch to oral therapy after 12 hrs of successful tocolysis. Magnesium gluconate (500 mg tabs) take 2 PO q4h.

**Corticosteroid and Vitamin K Therapy:**

Initiate therapy between 24-34 weeks gestational age unless there is evidence of clinical chorioamnionitis. Corticosteroids accelerate fetal maturation and decreases risk of respiratory distress syndrome, intraventricular hemorrhage, necrotizing enterocolitis, and mortality in premature newborns.

Betamethasone (Celestone) 12 mg IM q24hours x 2 doses **OR**

Dexamethasone (Decadron) 6 mg IM q6hours x 4 doses.

Consider Vitamin K 10 mg IM q1week until 32 weeks gestational age.

**Antibiotic Prophylaxis for Group B Streptococcus:**

Ampicillin 2 gm IV q6h or 500 mg PO q6h until cultures negative or x 10 days if beta strep colonization.

# Third Trimester Bleeding

**History:** Quantity, duration and character of bleeding; trauma, pelvic or back pain; contractions, uterine anomalies; fetal movement; history of previa or abruptio, poor nutrition, smoking, drug or ethanol abuse. Bleeding disorders, advanced maternal age, multiparity, prior C-section, multiple pregnancy.

**Physical:** Defer vaginal digital or speculum examination until ultrasound rules out placenta previa. Orthostatic vital signs. Abdominal exam (mark upper uterus with pen to evaluate for concealed hemorrhage); fetal heart tones.

Cautious sterile speculum exam to evaluate source of bleeding or ruptured membranes; cervix cultures, phosphatidylglycerol.

**Incidence:** Placenta previa occurs in 0.5% of deliveries, abruptio placenta 0.5-1.5%.

**Differential Diagnosis:** labor (bloody show), placenta abruptio, placenta previa, vasa previa, circumvallate placenta; cervical erosion, cervicitis, vaginitis, cervical polyps, carcinoma, trauma, uterine rupture, abnormal blood-clotting, marginal sinus rupture.

**Labs:** Stat ultrasound, T and C x 2-4 U PRBC's, CBC, PT/PTT, venous test tube clot test (clot formation in 4-8 min); Kleihauer-Betke test (if Rh negative patient), UA, drug screen, NST, consider amniocentesis for phosphatidylglycerol, L/S ratio; double set-up examination if warranted.

**Placenta Previa:**

**Classification of Placenta Previa:**

**Total Placenta Previa:** The placenta totally covers the internal cervical os.

**Partial Placenta Previa:** The placenta partially covers the internal cervical os.

**Marginal Placenta Previa:** The edge of the placenta extends to the margin of the internal cervical os.

**Low-Lying Placenta:** The placenta is within reach of the examining finger, introduced through the cervix.

**Expectant Previa Management:**

1. Indicated if estimated gestational age <36 weeks, immature L/S, PG, patient hemodynamically stable, no fetal distress and bleeding not persistent.
2. Bed rest and pelvic rest. $O_2$ by NC. Large bore 18 gauge IV in place and strict I and O. Type and cross available. Maintain hemoglobin >10.
3. Administer RhoGAM to Rh negative patient . Determined dose of RhoGAM by Kleihauer-Betke test.
4. Daily NST. Ultrasound q3-4 weeks to determine fetal growth.
5. Amniocentesis for L/S ratio, phosphatidylglycerol q7-10d starting at 36 weeks.
6. Give steroids for lung maturity from 24-34 weeks, and consider vitamin K 10 mg IM q week.
7. Consider cautious tocolysis (if stable and preterm labor) with MgSO4, or beta-mimetics. Continue antepartum vitamins, iron and Colace.
8. Consider vaginal delivery or C-section (when PG positive, at 36 weeks) depending on placental lie.

**Indications for Delivery of Placenta Previa Patients:**

Persistent labor, blood loss >500 cc, unstable bleeding requiring multiple transfusions, coagulation defect, documented fetal lung maturity.

**Abruptio Placentae:**

**Abruption with Nonviable Fetus:**

Large bore 18 gauge IV, LR, type and cross blood; oxygen 8 L by nasal cannula; coagulation defect replacement; perform amniotomy and deliver fetus. Monitor hematocrit, coagulation; maintain urine output (>30 ml/h).

**Management of Live Fetus:**

1. Bed rest and pelvic rest. $0_2$ by NC; large bore, 18 gauge, IV. Strict I/Os; monitor maternal blood pressure, heart rate, respiratory rate; monitor height of uterine fundus.
2. Keep type and cross-matched blood available. Crystalloid fluid and coagulation replacement.
3. Continuous fetal monitoring. Serial hematocrits.
4. In mild abruption >37 weeks or moderate to severe bleeding, consider oxytocin augmentation, amniotomy and preferably vaginal delivery. Perform C-section only if distress or severe hemorrhage.
5. With stable preterm fetus, consider MgSO4 or other tocolytics if patient is stable.

# Hypertension in Pregnancy

Hypertension occurs in 6-8% of pregnancies, and it is responsible for 15% of maternal deaths.

Maternal hypertension is also an important cause of perinatal morbidity and mortality, secondary to both direct fetal effects and iatrogenic preterm delivery performed for maternal indications. The cause of pregnancy induced hypertension is unknown, and the disease process is ultimately reversed only by delivery.

## I. Terminology

**A.** Two distinct entities are commonly encountered in pregnant women: chronic hypertension and pregnancy-induced hypertension (PIH). These two conditions may coexist; in fact, the risk of developing PIH is significantly increased in women with underlying chronic hypertension.

## II. Pregnancy Induced Hypertension

**A. Pregnancy-induced Hypertension is a Multiorgan Disease with the Following Manifestations:**

1. **Preeclampsia** occurs when renal involvement leads to proteinuria.
2. **Eclampsia** occurs when central nervous system involvement leads to seizures.
3. **HELLP syndrome** (hemolysis, elevated liver enzymes and low platelets) occurs when hematologic and hepatic manifestations are present.

**B. Risk Factors for the Development of Pregnancy Induced Hypertension**

| Factor | Risk Ratio |
|---|---|
| Nulliparity | 3:1 |
| Age > 40 y | 3:1 |
| African-American race | 1.5:1 |

| | |
|---|---|
| Family history of pregnancy-induced hypertension | 5:1 |
| Chronic hypertension | 10:1 |
| Chronic renal disease | 20:1 |
| Diabetes mellitus | 2:1 |
| Twin gestation | 4:1 |

## C. Clinical Manifestations of Pregnancy Induced Hypertension

### 1. Blood Pressure

**a.** Hypertension is defined as a sustained blood pressure increase to levels of 140 mm Hg systolic or 90 mm Hg diastolic.

**b.** PIH usually has an onset after 20 weeks of gestation, and chronic hypertension is defined as hypertension developing prior to 20 weeks of gestation.

**c.** Patients with gestational trophoblastic disease are an exception; they can develop classic features of PIH during the first or second trimester.

**d.** Patients who develop PIH and, in addition, manifest end-organ involvement or fetal growth restriction are regarded as having severe disease. Early delivery should be considered for such women, often despite fetal immaturity.

### 2. End-organ Manifestations That Indicate Severe Disease

#### a. Cardiovascular Effects

**(1)** Blood pressure is a product of systemic vascular resistance and cardiac output. In patients with PIH, elevations of both factors may contribute to hypertension.

**(2)** Vasospasm is a well-established component of this disease process and likely is a major cause of many or most serious end-organ effects.

#### b. Hematologic Effects

**(1)** The most frequent hematologic consequence of PIH is plasma volume contraction, which can result in decreased end-organ perfusion. This contraction is clinically reflected by a rise in hematocrit. This reduction in intravascular volume occurs despite an actual increase in total body water.

**(2)** Thrombocytopenia is the most frequent hematologic abnormality in PIH. The frequency and severity of this condition is increased when there is early onset of PIH or in the presence of chronic hypertension and superimposed PIH.

**(3)** A variant of severe PIH has been described in which hematologic abnormalities exist with severe preeclampsia/eclampsia. The syndrome of hemolysis, thrombocytopenia, and elevated hepatic transaminase levels is known as the HELLP syndrome. Normal blood pressures are initially found in approximately 10-20% of patients with these manifestations.

**c. Renal Function**

**(1)** Decreased glomerular filtration rate and proteinuria (urine protein exceeding 300 mg/24 h) are common in PIH, and all patients exhibit sodium retention.

**(2)** The results of a random dipstick assessment of proteinuria may not correlate with those of a 24-hour urine collection. Proteinuria occurs on the basis of glomerular damage and subsequent leakage.

**d. Neurologic Function**

**(1)** Hyperreflexia is commonly seen in patients with PIH. The presence or absence of hyperreflexia is not a factor in making or excluding the diagnosis of PIH.

**(2)** In severe cases, PIH can be complicated by generalized tonic-clonic seizures that can be fatal.

**e. Other Organ Involvement**

**(1)** Pulmonary edema can occur in patients with PIH and can be related to decreased colloid oncotic pressure, pulmonary capillary leak, left heart failure, iatrogenic fluid overload, or a combination of these factors.

**(2)** Elevated hepatic transaminase levels reflect hepatocellular damage.

**3. Effects on the Fetus**

**a.** The decrease in placental perfusion that accompanies maternal vasospasm in PIH results in increased perinatal morbidity and mortality.

**b.** Perinatal morbidity and mortality are increased secondary to intrauterine growth retardation (IUGR) and an increased incidence of placental abruption seen in women with PIH.

**Clinical Manifestations of Severe Disease in Patients with Pregnancy-induced Hypertension:**

Blood pressure > 160-180 mm Hg systolic or > 110 mm Hg diastolic
Proteinuria > 5 g/24 h (normal < 300 mg/24 h)
Elevated serum creatinine
Grand mal seizures (eclampsia)
Pulmonary edema
Oliguria < 500 mL/24 h
Microangiopathic hemolysis
Thrombocytopenia
Hepatocellular dysfunction (elevated alanine aminotransferase, aspartase aminotransferase)
Intrauterine growth retardation or oligohydramnios
Symptoms suggesting significant end-organ involvement: headache, visual disturbances, or epigastric or right-upper quadrant pain

**D. Antepartum Management of Pregnancy-Induced Hypertension**

1. Delivery is the only definitive treatment for PIH. Delivery is generally indicated in women at term with PIH of any severity and in preterm women with severe disease.
2. **In the patient with an unfavorable cervix** who exhibits only mild blood pressure elevations, minimal proteinuria, and no evidence of maternal end-organ involvement or fetal compromise, delivery may be appropriately delayed in an effort to obtain a more favorable cervix prior to induction. It is usually inappropriate to allow pregnancy in such patients to extend beyond 40 weeks of gestation.
3. **In women who have signs and symptoms of severe PIH at 32-34 weeks** of gestation, delivery should be considered. In some cases, the condition of women who initially manifest signs and symptoms of severe PIH will improve after observation and treatment with magnesium sulfate and antihypertensive agents such as hydralazine (Apresoline) or labetalol. In such women, continued observation is reasonable and appropriate at less than 32 weeks of gestation. If severe PIH persists or recurs, delivery should be instituted.
4. **If manifestations of severe PIH are present**, such as maternal oliguria, renal failure, and HELLP syndrome (hemolysis, elevated liver enzymes, and low platelet count), expedient delivery is recommended regardless of gestational age.
5. **In women who have PIH (including severe disease) less than 34 weeks of gestation,** the use of corticosteroids is appropriate; however, the health of the mother or the fetus should not be jeopardized by delaying delivery solely for this reason.
6. **Severe PIH at less than 28 weeks of gestation** may often be unsuccessful and hazardous to manage. Attempts at conservative management in women with severe pre-eclampsia at 18-27 weeks of gestation is associated with significant morbidity, including a risk of abruptio placentae, eclampsia, coagulopathy, renal failure, hypertensive encephalopathy, and intracerebral hemorrhage. The perinatal mortality rate is 87%.
7. **For the preterm patient with mild PIH**, conservative management is generally indicated. For any patient with PIH not undergoing delivery, blood pressure, proteinuria, renal and hepatic function and platelet count are closely monitored. Serial sonography for fetal growth and antepartum assessment of fetal well-being is also important.

**E. Intrapartum Management of Pregnancy Induced Hypertension**

1. **Prevention of Seizures with Magnesium Sulfate**
   - **a.** When delivery is indicated, parenteral magnesium sulfate is generally administered to prevent seizures; intravenous loading bolus (4 g over 20 minutes) followed by a continuous infusion (2-3 g/h) administered via a controlled infusion device.
   - **b.** Infusion of magnesium sulfate should be discontinued and a serum magnesium level obtained in any patient with loss of deep tendon reflexes, respiratory rate less than 12 per minute, and a decrease in urinary output to below 25 mL/h.
   - **c. Therapeutic range for magnesium:** 4-8 mg/dL.
   - **d.** When symptomatic magnesium overdose is suspected (eg, the presence of apnea, obtundation), it can be reversed by the intravenous administration of 1 g (10 mL of 10%) calcium gluconate intravenously over 2 minutes.

(1) Mechanical ventilation may be necessary until plasma levels have been reduced.

e. Magnesium is an effective anticonvulsant agent, but it does not substantially affect blood pressure; therefore, if blood pressure control is necessary, additional agents are mandatory.

2. **Blood Pressure Control**

a. When blood pressure exceeds 110 mm Hg diastolic or 180 mm Hg systolic, consideration should be given to lowering the blood pressure.

(1) Hydralazine hydrochloride is the drug of choice; given intravenously as a 5-10-mg bolus as often as every 20 minutes as necessary.

(2) Labetalol, 20 mg, given intravenously as often as every 10 minutes to a maximum dose of 300 mg, is an acceptable substitute. Onset of effect occurs within 5 minutes.

(3) Both hydralazine and labetalol may be given as an intermittent bolus or a continuous infusion with continuous blood pressure monitoring.

(4) Other agents that can be used include verapamil and nifedipine.

(5) Unresponsive blood pressure can occasionally require the administration of sodium nitroprusside, with central hemodynamic monitoring.

3. Delivery is indicated for any patient with persistent severe oliguria. If treatment is required before or after delivery, a fluid challenge of 500 mL may be given.

4. Vaginal delivery is generally preferable to cesarean delivery, even in patients with manifestations of severe disease. Under appropriate circumstances, cervical ripening with prostaglandin E2 gel may be considered. However, seriously ill patients with an unfavorable cervix may be better served by cesarean delivery rather than a long induction of labor.

## III. Chronic Hypertension

A. Elevation of blood pressure may cause intrauterine growth retardation and fetal death.

B. **Pharmacologic treatment** is usually not indicated in patients with chronic hypertension and diastolic pressures below 100 mm Hg because it does not improve either maternal or fetal outcome.

C. **Patients with chronic hypertension** who conceive while taking antihypertensive medications, except angiotensin-converting enzyme inhibitors, should continue these medications during pregnancy.

D. **If antihypertensive therapy** is to be initiated during gestation, alpha-methyldopa should be considered as a first-line agent because of extensive experience and fetal safety. Labetalol and atenolol are also acceptable alternatives. In pregnant patients taking beta-blocking agents, fetuses should be monitored carefully for IUGR, a condition that can be increased with the use of these drugs.

E. **Angiotensin-converting enzyme inhibitors** may be associated with fetal hypocalvaria, renal failure, oligohydramnios, arid fetal and neonatal death. Women who conceive while using such agents should be advised to discontinue them immediately.

F. **Diuretics** should not be initiated during pregnancy, as plasma volume reduction may have adverse fetal effects. Patients who conceive while on

chronic diuretic therapy may safely continue these agents.

**G.** Women with chronic hypertension are at increased risk for having a fetus with growth retardation. Serial sonography and antepartum fetal heart rate assessment may be helpful in monitoring fetal well-being. Such women are also at significant risk for developing superimposed PIH. Serial assessment of blood pressure and urine protein will assist in the early identification of superimposed PIH.

**H. Induction of labor** at term is an appropriate consideration for the woman with chronic hypertension and a favorable cervix.

## Eclamptic Seizure

1. Insert padded tongue blade between teeth. Prevent maternal trauma.
2. Oxygen at 4-6 L/min by face mask, place in lateral decubitus; oropharyngeal suctioning if needed.
3. Magnesium sulfate 4 gm IV over 3-5 min then 2 gm/h. If recurrent convulsion, may repeat 2-4 gm bolus over 3-5min **AND CONSIDER**
   Diazepam (Valium) 5-10 mg slow IV push, max 20 mg **OR**
   Amobarbital sodium 250 mg IV over 3 min (the patient may need intubation for respiratory depression) **OR**
   Pentobarbital 125 mg IV doses **OR**
   Phenytoin 18 mg/kg IV **AND/OR**
   Phenobarbital 100 mg/min IV up to 20 mg/kg.

**General Measures:** Foley catheter, monitor I and O; CXR with shielding to rule out aspiration; consider brain CT with shielding or lumbar puncture; monitor magnesium levels.

**Magnesium Toxicity:** Loss of patellar reflex is the first sign of toxicity at 10 mEq/L; respiratory paralysis occurs at >15 mEq/L.

1. Discontinue MgSO4, give oxygen 4-6 L/min by mask or assisted ventilation.
2. Calcium gluconate, give 10 ml slow IV push (1 gm, 10% sln).
3. Consider intubation and mechanical ventilation. Draw stat magnesium level.

## Polyhydramnios

**Definition:** Excessive amniotic fluid >2,000 cc. Ultrasound Diagnostic Criteria: Amniotic fluid index >25 cm.

**Incidence:** Occurs in 0.2-1.5% of pregnancies.

**Acute Polyhydramnios:** Rapid collection of amniotic fluid appearing within hours to days.

**Chronic Polyhydramnios:** Gradual collection of amniotic fluid occurring over weeks.

**Differential Diagnosis:** Idiopathic, maternal diabetes, multiple gestation, fetal CNS malformations (anencephaly, spina bifida) and gastrointestinal tract malformations (omphalocele, esophageal atresia), immune or nonimmune hydrops, trisomy 18, placental abnormalities.

**Signs and Symptoms:** Excessive uterine enlargement at 21-37 weeks; dyspnea,

edema, preterm labor; difficulty ambulating due to uterine overdistension.
**Complications of Polyhydramnios:** Increased perinatal mortality, placental abruption, dysfunctional labor pattern, postpartum hemorrhage, umbilical cord prolapse, fetal malpresentations.
**Labs:** Glucose tolerance test; ultrasound to rule out fetal anomalies and monitor amniotic fluid index; antepartum surveillance (kick counts, NST, BPP).

**Management:**

**Mild symptoms:** Expectant management with bed rest and antepartum surveillance.

**Severe symptoms:** Hospitalize with bed rest. Consider amniocentesis to relieve maternal distress (remove 500 cc/hour to maximum of 1,500-2,000 cc).

# Dystocia and Augmentation of Labor

**I. Normal Labor**

**A. First Stage of Labor**

1. The first stage of labor has been divided into a latent and an active phase.
2. **Latent Phase of Labor**
   a. During the latent phase, uterine contractions are infrequent and irregular and result in only modest discomfort. They result in gradual effacement and dilation of the cervix.
   b. A prolonged latent phase is considered as one exceeding 20 hours in the nullipara and 14 hours in the multipara.
3. **Active Phase of Labor**
   a. The active phase of labor is characterized both by an increased rate of cervical dilation and by descent of the presenting fetal part.
   b. The beginning of the active phase of labor is generally occurs when the cervix reaches 3-4 cm of dilatation.

**B. Second Stage of Labor**

1. **The second stage of labor** is usually brief, averaging 20 minutes for parous women and 50 minutes for nulliparous women.
2. The duration of the second stage of labor is unrelated to perinatal outcome in the absence of a nonreassuring fetal heart rate pattern as long as progress occurs, however slowly.

**II. Abnormal Labor**

**A. Dystocia** is defined as difficult labor or childbirth resulting from abnormalities of the cervix and uterus, the fetus, the maternal pelvis, or combinations of these factors.

**B. Cephalopelvic disproportion** is a disparity between the size of the maternal pelvis and the fetal head that precludes vaginal delivery. This condition can rarely be diagnosed in advance with certainty. The term “failure to progress” should no longer be used.

**C. Slower-than-normal (protraction disorders) or complete cessation of progress (arrest disorder):** These disorders require the parturient to have entered the active phase of labor.

**D. Diagnostic Criteria For Abnormal Labor Patterns**

| Labor Pattern | Nulligravida | Multipara |
|---|---|---|
| **Protraction disorders** | | |
| Dilation | <1.2 cm/h | <1.5 cm/h |
| Descent | <1.0 cm/h | <2.0 cm/h |
| **Arrest disorders** | | |
| Dilation | >2 h | >2 h |
| Descent | >1 h | >1 h |

**E.** Abnormalities of the first stage of labor complicate 8-11% of all cephalic deliveries. Second-stage abnormalities may be at least as common. Identification of abnormal labor and institution of the proper management for dystocia require assessment of uterine contractility and expulsive effort, the fetus, and the pelvic passage.

## III. Assessment of Labor Abnormalities

**A. Labor Abnormalities Due to Uterine Contractility**: The minimal uterine contractile pattern of women in spontaneous labor consists of 3 to 5 contractions in a 10-minute period.

**B. Labor Abnormalities Due to Fetal Characteristics**

1. Assessment of the fetus in cephalic presentation consists of estimating fetal weight and position. Estimations of fetal size, even those obtained by ultrasonography, are frequently inaccurate, especially in fetuses weighing more than 4-4.5 kg.
2. Consequently, with cephalic presentation in the first stage of labor, the diagnosis of dystocia can not be made unless the active phase of labor and adequate uterine contractile forces have occurred.
3. Fetal anomalies such as hydrocephaly, encephalocele, and soft tissue tumors may obstruct labor. Fetal imaging should be considered when malpresentation or anomalies are suspected based on vaginal or abdominal examination or when the presenting fetal part is persistently high.

**C. Labor Abnormalities Due to the Pelvic Passage**

1. Inefficient uterine action should be corrected before attributing dystocia to a pelvic problem.
2. The bony pelvis is very rarely the factor that limits vaginal delivery of a fetus in cephalic presentation. Although grossly misshapen pelves may infrequently result from severe malnutrition or trauma, radiographic pelvimetry is of limited value in managing most cephalic presentations.
3. Clinical pelvimetry can only be useful to qualitatively identify the general architectural features of the pelvis.

## IV. Augmentation of Labor

**A.** Uterine hypocontractility should be augmented only after both the maternal pelvis and fetal presentation have been assessed.

**B.** Contraindications to augmentation include placenta or vasa previa, umbilical cord presentation, prior classical uterine incision, active genital herpes infection, pelvic structural deformities, or invasive cervical cancer.

**C. Oxytocin (Pitocin)**

1. The half-life of oxytocin is 3-5 minutes, and oxytocin-induced hyperstimulation usually resolves quickly with discontinuation of the oxytocin infusion.

2. The goal of oxytocin administration is to stimulate uterine activity that is sufficient to produce cervical change and fetal descent while avoiding uterine hyperstimulation and fetal compromise.
3. **Minimally effective uterine activity** is 3 contractions per 10 minutes averaging greater than 25 mm Hg above baseline. A maximum of 5 contractions in a 10-minute period with resultant cervical dilatation is considered adequate.
4. **Hyperstimulation** is characterized by more than five contractions in 10 minutes, contractions lasting 2 minutes or more, or contractions of normal duration occurring within 1 minute of each other.
5. Oxytocin is administered only when a patient is progressing slowly through the latent phase of labor or has a protraction or an arrest disorder of labor, and when a hypotonic uterine contraction pattern is identified, and when there are no maternal or fetal contraindications.
6. An examination should be performed at initiation of oxytocin infusion.
7. Oxytocin is usually diluted 10 units in 1 liter of normal saline IVPB.
8. **Labor Stimulation with Oxytocin**

| Regimen | Starting Dose (mU/min) | Incremental Increase (mU/min) | Dosage Interval (min) | Maximum Dose (mU/min) |
|---|---|---|---|---|
| Low-Dose | 0.5-1 | 1 | 30-40 | 20 |
| High-Dose | 6 | 6 | 15 | 40 |

9. The resting uterine tone and frequency and duration of uterine contractions should be monitored.
10. **Management of Oxytocin-Induced Hyperstimulation**
    a. The most common adverse effect is fetal heart rate deceleration associated with uterine hyperstimulation. Decreasing the oxytocin dose rather than stopping it may correct the abnormal pattern yet prevent an unwarranted delay in delivery.
    b. Additional measures may include changing the patient to the lateral decubitus position and administering oxygen or more intravenous fluid.
    c. When restarting the oxytocin, it may be necessary to lower the dose.
    d. If oxytocin-induced uterine hyperstimulation does not respond to conservative measures, intravenous terbutaline (0.125-0.25 mg) or magnesium sulfate (2-6 g in 10-20% dilution) may be used to stop uterine contractions.

## Shoulder Dystocia

**Definition:** Failure of the shoulders to deliver after application of gentle, downward traction and ample episiotomy. Occurs in 0.15-0.6% of deliveries.
**History:** Diabetes, large size by ultrasounds, maternal obesity, postterm pregnancy.
**Risk factors:** Macrosomia, diabetes, obesity (>200 lbs); postterm, excess weight gain, prior dystocia, platypoid/contracted pelvis, prolonged 2nd stage, oxytocin induction, midpelvic delivery, erythroblastosis fetalis.
**Physical:** Estimated fetal weight by >4000 gms, "Turtle sign" (fetal head recoils against perineum).

**Management:**

1. **Call for Assistance:** Pediatrics, anesthesia standby, empty bladder with catheter.
2. **Ample Episiotomy:** Midline episiotomy (consider proctoepisiotomy).
3. **Deliver:** head and body consecutively, without stopping to suction on perineum.
4. **McRobert's Maneuver:** Flexing the thighs at the hips and pulling them to the maternal abdomen, with supra-pubic pressure from assistant. A generous episiotomy should be cut.
5. **Wood's Screw Maneuver:** Place hand behind the posterior shoulder of fetus and progressively rotate the shoulder 180 degrees in a cork screw manner to release the anterior shoulder.
6. **Rubin's Maneuvers:** First rock fetal shoulders side to side, then place two fingers in the birth canal (at the most accessible fetal shoulder) and push the shoulder towards the anterior fetal chest surface to free the impacted shoulder.
7. **Posterior Arm Release:** Flex posterior fetal forearm, grasp hand and sweep across infant's chest and bring hand out of vagina. Apply gentle traction to deliver anterior shoulder. If necessary rotate posterior shoulder 180°, sliding freed arm under pubic symphysis; deliver opposite shoulder in a similar manner.
8. **Other Maneuvers:** Fracture of humerus or clavicle, symphysiotomy. Zavanelli maneuver: flex head, reinsert into vagina to prerestitution position, and perform C-section.

## Induction of Labor

Induction of labor consists of stimulation of uterine contractions before the spontaneous onset of labor for the purpose of accomplishing delivery. Fetal membranes may be intact or ruptured prior to induction of labor.

**I. Indications and Contraindications**

**A. Common Indications for Induction of Labor**

1. Pregnancy-induced hypertension
2. Premature rupture of membranes
3. Chorioamnionitis
4. Suspected fetal jeopardy (eg, severe fetal growth retardation, isoimmunization)
5. Maternal medical problems (eg, diabetes mellitus, renal disease, chronic pulmonary disease)
6. Fetal demise
7. Postdate pregnancy

**B. Contraindications to Labor Induction or Spontaneous Labor**

1. Placenta or vasa previa
2. Transverse fetal lie
3. Prolapsed umbilical cord
4. Prior classical uterine incision
5. Active genital herpes infection

**C. Obstetric Conditions Requiring Special Caution During Labor**

**Induction**

1. Multifetal gestation
2. Polyhydramnios
3. Maternal cardiac disease
4. Abnormal fetal heart rate patterns not requiring emergency delivery
5. Grand multiparity
6. Severe hypertension
7. Breech presentation
8. Presenting part above the pelvic inlet

**D.** A trial of labor is not contraindicated in women with one or more previous low transverse cesarean deliveries. Risks of instrumental vaginal delivery, uterine scar dehiscence, and poor neonatal outcome have not been shown to be increased with induced rather than spontaneous labor.

## II. Requirements for Induction

**A.** Labor should be induced only after both the mother and fetus have been examined thoroughly, and after fetal maturity has been documented.

**B. Criteria for Fetal Maturity**

1. Fetal heart tones have been documented for 30 weeks by Doppler.
2. It has been 36 weeks since a positive serum or urine human chorionic gonadotropin pregnancy test was performed by a reliable method.
3. An ultrasound measurement of the crown-rump length, obtained at 6-11 weeks, supports a gestational age of 39 weeks or more.
4. An ultrasound scan, obtained at 12-20 weeks, confirms the gestational age of 39 weeks or more determined by clinical history and physical examination.

**C.** If one or more of these criteria are not met, amniocentesis should be performed to document fetal maturity.

**D.** A cervical examination should be performed immediately before cervical ripening or oxytocin infusion.

**E.** During the induction of labor, uterine activity and fetal heart rate should be monitored closely.

**F.** The duration of labor induction is affected by parity and cervical status and predicted is only to a minor degree by the baseline uterine activity and the sensitivity to oxytocin.

## III. Cervical Ripening

**A.** In most pregnancies, some degree of spontaneous cervical ripening is present near term and generally precedes spontaneous labor. However, in a significant proportion of postdate pregnancies, the condition of the cervix is unfavorable.

**B. Prostaglandin E2**

1. Local application of prostaglandin E2 gel is a widely used agent for cervical ripening. Prostaglandin E2 gel is available in a 2.5-mL syringe that contains 0.5 mg of dinoprostone (Prepidil, a form of prostaglandin E2).
2. The intracervical route offers the advantages of prompting little uterine activity and greater efficacy in the very unripe cervix.
3. A prostaglandin vaginal insert (Cervidil, 10 mg of dinoprostone) provides a lower rate of release of medication (0.3 mg/h) than the gel. The vaginal insert has an advantage over the gel because it can be removed should hyperstimulation occur.
4. Part of the prostaglandin-induced cervical ripening process often

includes initiation of labor that is similar to that of spontaneous labor. Although uterine-stimulating effects may not be clinically apparent, prostaglandin E2 may enhance sensitivity to oxytocin.

5. A reassuring fetal heart rate tracing should be present, there should be an the absence of regular uterine contractions (every 5 minutes or less).
6. **Protocol for Administration**
   - **a.** The patient should remain recumbent for at least 30 minutes. When contractions occur, they are usually apparent in the first hour and show peak activity in the first 4 hours.
   - **b.** Effects of prostaglandin E2 may be exaggerated with oxytocin; therefore, oxytocin induction should be delayed for 6-12 hours. If the patient continues to have uterine activity as a result of the prostaglandin E2 gel, oxytocin should be deferred or used with caution in low doses.
   - **c.** If there is insufficient cervical change with minimal uterine activity with one dose of prostaglandin E2, a second dose of prostaglandin E2 may be given 6-12 hours later.
7. **Side Effects**
   - **a.** The rate of uterine hyperstimulation (6 or more contractions in 10 minutes for a total of 20 minutes) is 1% for the intracervical gel (0.5-mg dose).
   - **b.** When hyperstimulation occurs, it usually begins within 1 hour after the gel is applied. Pulling on the tail of the net surrounding the vaginal insert will usually reverse this effect. Irrigation of the cervix and vagina to remove the gel is not helpful in reversing hyperstimulation.
   - **c.** A beta-adrenergic agent (eg, intravenous or subcutaneous terbutaline, 250 mg) may be given and will result in rapid resolution of hyperstimulation.
   - **d.** Maternal systemic effects from low-dose prostaglandin E2 (fever, vomiting, diarrhea) are negligible.

## IV. Amniotomy

**A.** Artificial rupture of membranes is another method of labor induction. Routine early amniotomy results in a modest reduction in the duration of labor.

**B.** During amniotomy palpate for an umbilical cord, and avoid dislodging the fetal head. The fetal heart rate should be recorded before and immediately after the procedure.

## V. Oxytocin

**A.** The goal of oxytocin administration is to stimulate uterine activity sufficient to produce cervical change and fetal descent while avoiding uterine hyperstimulation and fetal compromise. There is no physiologic difference between oxytocin-stimulated labor and natural labor.

**B. Administration**

1. Oxytocin is usually diluted 10 units in 1 liter (10 mU/ mL) of normal saline solution.
2. Starting dosage is 0.5-2 mU/min, with increases in 1-2 mU/min increments every 30-60 minutes.
3. Following IV administration, a uterine response occurs within 3-5 minutes.

4. A cervical dilation rate of 1 cm/h in the active phase indicates that labor is progressing sufficiently.

**C. Side Effects**

1. Use of oxytocin may result in uterine hyperstimulation or rupture. Uterine hyperstimulation or a resting tone above 20 mm Hg between contractions can lead to uteroplacental hypoperfusion and fetal hypoxia.
2. Oxytocin does not cross the placenta; therefore, it has no direct effects on the fetus.
3. Hypotension can be a complication of oxytocin infusion but is seen only with rapid intravenous injection.
4. **Uterine Hyperstimulation**
   - **a.** The most common adverse effect is fetal heart rate deceleration associated with uterine hyperstimulation.
   - **b.** Decreasing the oxytocin dose rather than stopping it may correct the abnormal pattern yet prevent an unwarranted delay in delivery.
   - **c.** Additional measures may include changing the patient to the lateral decubitus position, administering oxygen, or more intravenous fluid. When restarting the oxytocin, the dose should be lowered and the interval lengthened.

**VI. Serial Inductions**

**A.** Serial induction is an alternative to continuous induction.

**B.** Serial induction consists of repeated intervals of oxytocin administration with intervening intervals of rest.

## Post-Term Pregnancy

**Definition:** A pregnancy with a gestational age >42 weeks (≥294 days from first day of LMP). Occurs in 10% of pregnancies.

**Naegele's Rule:** Estimated date of confinement is calculated by subtracting 3 months from the first day of LMP, and adding 7 days.

**History:** Early ultrasound dating. Determine the exact date of last menstrual period, date of quickening (16-20 weeks), date of first auscultation of fetal heart tones; uterine size at early exam consistent with dates; assess the reliability of dates.

**Physical:** Fundal height, estimated fetal weight, ultrasound.

**Differential Diagnosis:** Incorrect dates (the most common cause of postterm pregnancy), idiopathic, fetal conditions (anencephaly), placental sulfatase deficiency.

**Complications:** Oligohydramnios, meconium, macrosomia, dysmaturity (placental insufficiency).

**Antepartum Testing and Management:**

**40 Weeks:** Evaluate cervix weekly.

**41-42 Weeks:** Nonstress test and amniotic fluid index (modified biophysical profile) 2 times per week. If nonreassuring, obtain contraction stress test, and consider delivery. Educate patient on kick counts.

**At 42 Weeks:** Evaluate cervix. If cervix favorable after 42 weeks, consider induction.

**Ripe Cervix and Complications (hypertension, macrosomia,**

**oligohydramnios, etc):** Consider induction.

**Unripe Cervix and No Complications:** Conservative management with NST and AFI 2 times per week; if nonreactive, perform CST or biophysical profile. If CST is nonreassuring, consider induction. At onset of labor, begin external fetal monitoring.

**Unripe Cervix after 42 wks or Complications or Non-reassuring Antepartum Test, consider:**

**Cervical Priming:**

Dinoprostone cervical gel (Prepidil gel) 0.5 mg. Administer gel via applicator into endocervix q6hours (maximum dose 1.5 mg/24 hours). Start Pitocin 6-12 hours after last dose.

Prostaglandin E2 gel (Prostin), 1-5 mg into the posterior fornix or 0.25-0.5 mg intracervically (use a shortened intrauterine pressure catheter with syringe attached, to place gel) or laminaria placement. Oxytocin should not be administered until 6-12 hours after last gel administration.

**Induction:** See Pitocin induction protocol, page 238. Amniotomy when well dilated and fetal head applied to the cervix.

# Fetal Heart Rate Monitoring

Intrapartum fetal heart rate (FHR) monitoring can identify fetal hypoxia, umbilical cord compression, tachycardia, and acidosis. A normal FHR pattern is reassuring and is nearly always associated with a newborn who is vigorous at birth.

Transient and repetitive episodes of hypoxia, even at the level of the central nervous system (CNS), are extremely common during normal labor and are generally well tolerated by the fetus. Only when hypoxia and resultant metabolic acidemia reach extreme levels is the fetus at risk for long-term neurologic impairment.

## I. Physiologic Basis of Fetal Heart Patterns

**A.** Uterine contractions decrease placental blood flow and result in intermittent episodes of decreased oxygen delivery.

**B.** Normally, the fetus tolerates contractions without difficulty, but if the frequency, duration, or strength of contractions becomes excessive, fetal hypoxemia may result.

## II. Fetal Heart Rate Patterns

### A. Variable Decelerations

**1.** Variable decelerations are defined as slowing of the FHR with abrupt onset and return. They are frequently preceded and followed by small accelerations of the FHR.

**2.** These decelerations vary in depth, duration, and shape on the tracing but generally coincide with cord compression which, in turn, usually coincides with the timing of the uterine contractions. Occasionally, head compression can cause variable decelerations.

### B. Late Decelerations

**1.** Late decelerations are U-shaped decelerations of gradual onset and gradual return that are usually shallow (10-30 beats per minute) and that reach their nadir after the peak of the contraction.

**2.** Late decelerations occur when uterine contractions result in decreased fetal oxygenation. In milder cases, they can be a reflex and the result

of CNS hypoxia; in more severe cases, they may be the result of direct myocardial depression.

**C. Early Deceleration**

1. Early decelerations are shallow and symmetrical with a pattern similar to that of late decelerations but reach their nadir at the same time as the peak of the contraction.
2. They are seen in the active phase of labor, and are benign changes caused by fetal head compression.

**D. Fetal Heart Rate**

1. The FHR at term usually ranges from 120-160 bpm. The initial response of the FHR to intermittent hypoxia is deceleration, but baseline tachycardia may develop if the hypoxia is prolonged and severe.
2. Tachycardia also may be associated with maternal fever, intraamniotic infection, and congenital heart disease.
3. Decreasing fetal heart rate variability may serve as an indication of the fetal response to hypoxia in the absence of maternal sedation or extreme prematurity.
4. Decelerations of the FHR usually will precede the loss of variability; fetal sleep cycle or medications may also decrease the activity of the CNS and the variability of the FHR.
5. The development of decreased variability in the absence of decelerations is unlikely to be due to hypoxia.

**E. Accelerations**

1. Accelerations are common periodic changes in labor and are nearly always associated with fetal movement.
2. These changes are virtually always reassuring and almost always confirm that the fetus is not acidotic.

## III. Guidelines for Performing Fetal Heart Rate Monitoring

**A.** Continuous FHR and contraction monitoring may be accomplished externally or internally. Internal FHR monitoring is accomplished with a spiral wire placed directly on the fetal scalp or other presenting part. This method records the fetal electrocardiogram.

**B.** Uterine contractions also may be monitored externally or internally.

**C.** The paper speed is usually 3 cm/min.

## IV. Interpretation of Fetal Heart Rate Patterns

**A.** The initial FHR pattern should be carefully evaluated for accelerations, decelerations, and abnormalities of the baseline.

**B.** Variable decelerations are the most common decelerations seen in labor and indicate umbilical cord compression; they are generally associated with a favorable outcome. Only when they become persistent, progressively deeper, and longer lasting are they considered nonreassuring.

1. Persisting variable decelerations to less than 70 bpm lasting greater than 60 seconds are generally concerning.
2. Variable deceleration with persistently slow return to baseline are also considered nonreassuring, as these reflect persistent hypoxia. Nonreassuring variable decelerations associated with the development of tachycardia absence of accelerations, and loss of variability correlate with fetal acidosis.

**C.** Late decelerations may be secondary to transient fetal hypoxia in response to the decreased placental perfusion associated with uterine contractions.

1. Occasional or intermittent late decelerations are not uncommon during labor. When late decelerations become persistent (present with most contractions), they are considered nonreassuring, regardless of the depth of the deceleration.
2. Late decelerations generally become deeper as the degree of hypoxia becomes more severe.

**D. A prolonged deceleration** is an isolated, abrupt decrease in the FHR to levels below the baseline of at least 60-90 seconds in duration.
1. These changes are always of concern and may be caused by virtually any mechanism that can lead to fetal hypoxia.
2. The severity of the event causing the deceleration is usually reflected in the depth and duration of the deceleration, as well as the degree to which variability is lost during the deceleration.
3. The degree to which such decelerations are nonreassuring depends on their depth and duration, loss of variability, and the frequency and progression of recurrence.

**E.** A sinusoidal heart rate pattern consists of a regular oscillation of the baseline long-term variability resembling a sine wave.
1. This smooth, undulating pattern, lasting at least 10 minutes, has a relatively fixed period of three to five cycles per minute and an amplitude of 5-15 bpm above and below the baseline. Short-term variability is usually absent.
2. This rarely occurring pattern may be associated with severe chronic, fetal anemia, severe hypoxia and acidosis.

## V. Management of Nonreassuring Patterns

### A. Approach to a Nonreassuring Pattern
1. Determine the etiology of the pattern.
2. Attempt to correct the pattern by specifically correcting the primary problem or by instituting general measures aimed at improving fetal oxygenation and placental perfusion.
3. If attempts to correct the pattern are not successful, consider fetal scalp blood pH assessment.
4. Determine whether operative intervention is warranted.

**B. Late decelerations:** Excessive uterine contractions, maternal hypotension, or maternal hypoxemia should be considered.

**C. Severe variable or prolonged decelerations:** A pelvic examination should be performed immediately to rule out umbilical cord prolapse or rapid descent of the fetal head.

**D. If no causes of such decelerations are found**, one can usually conclude that umbilical cord compression is responsible.

**E. Measures that may improve fetal oxygenation and placental perfusion**
1. **Oxygen Therapy:** When there is evidence of a nonreassuring pattern a significant increase in maternal oxygenation may be accomplished with oxygen at a flow rate of 8-10 L/min with a tight-fitting face mask.
2. **Maternal Position**
   **a.** In the supine position, there is compression of the vena cava and aortoiliac vessels by the gravid uterus. This results in decreased return of blood to the maternal heart leading to a fall in cardiac output, blood pressure, and uterine blood flow.
   **b. The lateral recumbent position** (either side) is-best for maximizing cardiac output and uterine blood flow and is often associated

with improvement in the FHR pattern.

3. **Oxytocin**
   - **a.** If nonreassuring FHR changes occur in patients receiving oxytocin, the infusion should be decreased or discontinued.
   - **b.** Restarting the infusion at a lower rate may be better tolerated.
4. **Intravenous Hydration:** If maternal intravascular status is low, intravenous hydration should be initiated.
5. **Amnioinfusion**
   - **a.** Variable decelerations that occur prior to fetal descent at 8-9 cm of dilatation are most frequently caused by oligohydramnios.
   - **b.** Replacement of amniotic fluid with normal saline infused through an intrauterine pressure catheter decreases both the frequency and severity of variable decelerations in patients with decreased amniotic fluid volume.
   - **c.** Replacement of amniotic fluid may be done therapeutically in patients with progressive variable decelerations. In patients with known oligohydramnios, amniotic fluid may be replaced prophylactically at the onset of labor in and effort to prevent variable decelerations.
   - **d.** Saline amnioinfusion relieves most repetitive variable or prolonged intrapartum decelerations and is without apparent maternal or fetal risk. There is also a decrease in newborn respiratory complications from meconium due to the dilutional effect of amnioinfusion.
   - **e.** Continuous amnioinfusion usually begins with a loading dose of 10 mL/min for 1 hour followed by a maintenance dose of 3 mL/min with an infusion pump. The use of double-lumen uterine pressure catheters is recommended.
   - **f.** Care should be taken to avoid overdistending the uterine cavity. Increased basal uterine tone and sudden deterioration of FHR, and abnormal FHR secondary to polyhydramnios has been reported following amnioinfusion. The onset of beneficial effects of amnioinfusion requires at least 20-30 minutes.
6. **Tocolytic Agents**
   - **a.** If a nonreassuring FHR pattern results from excessive uterine contractions, uterine activity should be decreased by decreasing or discontinuing dose of oxytocin.
   - **b.** Terbutaline, 0.25 mg subcutaneously or 0.125-0.25 mg intravenously, will suppress contractions. Magnesium sulfate is also of value in rapidly providing uterine relaxation and improving fetal condition.
   - **c.** Even in the absence of excessive uterine contractions, abnormal FHR patterns may occur in response to contractions. Newborn condition may be improved by tocolytic agents.
   - **d.** Beta agonists elevate both serum glucose levels and maternal and fetal heart rate. Maternal pulse pressure is widened, and peripheral vascular resistance decreases.

**Intrapartum Fetal Resuscitation for Abnormal Heart Rate Patterns:**

1. Change to lateral decubitus.
2. 100% Oxygen via mask.
3. Discontinue oxytocin.
4. Vaginal exam to rule out cord prolapse or imminent delivery.
5. Correct hypotension with IV fluids.
6. Suppress contractions with terbutaline sulfate, 0.25 mg SC.
7. Consider obtaining a scalp pH. If the pH is normal (>7.20-7.25), repeat in 15-30 minutes as clinically indicated. If the pH is abnormal (<7.20), delivery is usually indicated. Consider administering a scalp or sound stimulation test.
8. Amnioinfusion via intrauterine pressure catheter (for variable decelerations).
9. Consider cesarean section.

**VI. Management of Persistent Nonreassuring Fetal Heart Rate Patterns**

**A.** If the FHR pattern remains uncorrected, the decision to intervene depends on the likelihood of severe hypoxia and the possibility of metabolic acidosis, and on the estimated time to spontaneous delivery.

**B. Persistent nonreassuring decelerations with normal FHR variability and absence of tachycardia** generally indicates the lack of fetal acidosis.

**C. Persistent late decelerations or severe variable decelerations associated with absence of variability** are always nonreassuring and generally require prompt intervention unless they spontaneously resolve or can be corrected rapidly with conservative measures (oxygen, hydration, or maternal repositioning). In the presence of nonreassuring decelerations, a fetal scalp electrode should be placed.

**D. Spontaneous accelerations** of greater than 15 bpm lasting at least 15 seconds virtually always indicates the absence of fetal acidosis. Fetal scalp stimulation or vibroacoustic stimulation can be used to induce accelerations, and these also indicate the absence of acidosis. If the fetus fails to respond to stimulation in the presence of an otherwise nonreassuring pattern, there is about a 50% chance of acidosis. In these fetuses, assessment of scalp blood pH, may be used to clarify the acid-base status.

**E.** If the FHR pattern remains worrisome, either induced accelerations or repeat assessment of scalp blood pH is required every 20-30 minutes for continued reassurance. In cases in which the FHR patterns are persistently nonreassuring and acidosis is present, the fetus should be promptly delivered by either cesarean section or vaginal delivery.

## Antepartum Fetal Surveillance

The most commonly used tests are the contraction stress test (CST), the nonstress test (NST), the biophysical profile (BPP), the modified biophysical profile (MBPP), and fetal movement assessment (ie, kick counts). No single type

of testing has been shown convincingly to be superior to the others.

**I. Contraction Stress Test**

**A.** The CST is evaluates on the response of the fetal heart rate to uterine contractions.

**B.** It relies on the premise that during conditions when fetal oxygenation is only marginally adequate with the uterus at rest, oxygenation will be transiently worsen when uterine contractions occur. The intermittent fetal hypoxemia during contractions leads to late decelerations of the fetal heart rate.

**C.** Persistent late decelerations are a reliable reflection of suboptimal fetal oxygenation.

**D.** Uterine contractions may also produce or accentuate a pattern of variable decelerations due to cord compression in a susceptible fetus, suggesting possible oligohydramnios.

**E. Contraction Stress Test Technique**

1. The fetal heart rate and contraction activity is monitored, and a baseline tracing is obtained. The test is considered satisfactory if at least 3 contractions of 40 seconds duration or more are present in a 10-minute period. If fewer than 3 contractions of at least 40 seconds duration occur during the 10 minute period, contractions are induced with either nipple stimulation or intravenous oxytocin.
2. Nipple stimulation is usually successful in inducing an adequate contraction pattern. The woman is instructed to rub one nipple gently, through her clothing, for 2 minutes or until a contraction begins. Stimulation is then stopped and restarted after 5 minutes if by that time the contraction frequency has not become adequate as defined above. The amount of time required for the test is often half of that needed when intravenous oxytocin is given.
3. Oxytocin may also be used to stimulate contractions by infusing it at a low rate of 0.5-1.0 mU/min and doubled every 15-20 minutes until an adequate contraction pattern occurs.

**F. Interpretation of CST Results**

1. **Negative:** No late decelerations
2. **Positive:** Late decelerations following 50% or more of contractions, even if the contraction frequency is less than 3 in 10 minutes.
3. **Suspicious (equivocal):** Intermittent late or significant variable decelerations.
4. **Unsatisfactory:** Fewer than 3 contractions per 10 minutes or a poor-quality tracing.

**G. Relative Contraindications** for the CST include conditions associated with possible preterm labor, uterine rapture, or uterine bleeding:

1. Preterm labor or certain patients at high risk for preterm labor
2. Preterm rupture of membranes
3. Classical uterine incision scar
4. Known placenta previa

**II. Nonstress Test**

**A.** The NST is based on the premise that the heart rate of a fetus that is not acidotic or neurologically depressed will temporarily accelerate with fetal movement. Such heart rate reactivity is a good indicator of fetal autonomic function; loss of reactivity is associated most commonly with a sleep cycle but may also result from any cause of central nervous system depression,

including fetal acidosis.

**B. Nonstress Test Technique**

1. Preferably, the patient has not been fasting and has not smoked recently, as this may adversely affect results.
2. A fetal heart monitor is applied, and the tracing is observed for fetal heart rate accelerations peaking at least 15 beats per minute above the baseline and lasting 15 seconds. The tracing may be continued for 40 minutes.
3. Acoustic stimulation may elicit fetal heart rate accelerations if the fetus that is not acidotic, and such stimulation may safely reduce overall testing time without compromising sensitivity for fetal acidosis.

**C. Interpretation**

1. The NST is considered reactive (normal) if there are two or more fetal heart rate accelerations within a 20-minute period.
2. A nonreactive tracing is one without sufficient fetal heart rate accelerations over a 40-minute period.

## III. Biophysical Profile

**A.** Biophysical profile testing consists of an NST with the addition of four ultrasound observations. The five components are as follows:

1. Reactive NST
2. Fetal breathing movements (one or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes).
3. Fetal movement (3 or more discrete body or limb movements within 30 minutes).
4. Fetal tone (1 or more episodes of extension of a fetal extremity with return to flexion).
5. Quantitation of amniotic fluid volume.
   - **a.** The amniotic fluid index consists of a semi-quantitative, four-quadrant assessment of amniotic fluid depth.
   - **b.** Each of the five observations is assigned a score of 2 (normal) or 0 (abnormal). A total score of 8 or 10 is normal; a score of 6 is considered equivocal (retest in 12-24 hours); and a score of 4 or less is abnormal.

**B. Modified Biophysical Profile**

1. This profile consists of a nonstress test and an amniotic fluid index. An NST is a short-term indicator of fetal acid-base status, and amniotic fluid index is an indication of long-term placental function.
2. The modified biophysical profile is a less cumbersome than complete BPP assessment and appears to be equivalent in establishing the likelihood that fetal death will not occur.

## IV. Assessment of Fetal Movement

**A.** This test is usually performed by the patient at her home by having the her lie on her side and count distinct fetal movements.

**B.** Perception of 10 distinct movements in a period of up to 2 hours is considered reassuring. After 10 movements have been perceived, the count may be discontinued.

**C.** If a reassuring count is not observed, a biophysical means of fetal assessment such as a NST should be completed.

**D.** Maternal perception of a relative decrease in fetal activity, compared with the previous level, is an important factor.

**E.** Women at increased risk for antepartum fetal demise who are not

undergoing daily biophysical testing should be instructed in fetal activity assessment.

## V. Clinical Application of Antepartum Tests

### A. Indications

1. The primary indication for biophysical antepartum tests of fetal well-being is a pregnancy at increased risk for antepartum fetal demise, including the following:

- Decreased fetal movement
- Hypertensive disorders
- Diabetes mellitus (insulin treated)
- Oligohydramnios
- Intrauterine growth retardation
- Postdate pregnancy (42 weeks or more)
- Isoimmunization
- Chronic renal disease
- Systemic lupus erythematosus
- Maternal cyanotic heart disease
- Hemoglobinopathies
- Previous unexplained fetal demise
- Multiple gestation with significantly discordant growth
- Hyperthyroidism

### B. Choice of Test

1. Then NST is the test used most frequently. The CST is an earlier predictor of fetal compromise than the NST.

### C. Timing of Antepartum Testing

1. With most at-risk pregnancies, testing usually begins by 32-34 weeks of gestation.
2. In pregnancies with particularly high-risk conditions, testing might begin as early as 26-28 weeks.
3. **Common Testing Schedules**

| Disorder | Age to Initiate Testing |
|---|---|
| **Hypertensive Disorders** | |
| Chronic hypertension | 34 wks |
| Preeclampsia | When diagnosed after 26 wks |
| Cyanotic heart disease | 34 wks |
| **Diabetes Mellitus:** | |
| Uncomplicated gestational diabetic (class A) | 40 wks |
| Class A with history of stillbirth, hypertension | 34 wks |
| Class B, C, D | 32-34 wks |
| Class F, R | 26 wks |
| **Other Disorders:** | |
| Collagen-vascular disease (SLE) | 32-34 wks |
| Previous stillbirth, suspected IUGR or oligohydramnios, decreased fetal movement, discordant twin gestation | 26 weeks or when suspected |
| Hemoglobinopathy (SS Thalassemia) | 34 wks |
| Rh isoimmunization | 26-32 wks |
| Post-date pregnancy | at 41 wks |

### D. Frequency of Testing

1. When the clinical condition that has prompted testing persists, a reassuring test (reactive NST, negative CST, normal BPP) should be repeated (usually every 7 days) until delivery to monitor for continued fetal well-being.
2. If significant clinical deterioration occurs (eg, worsening hypertension,

ketoacidosis, or hemorrhage), reevaluation is indicated.

3. The testing interval may be more frequent (eg, daily) especially when using the NST alone, for women with some high-risk conditions, such as insulin-requiring diabetes, severe chronic hypertension, intrauterine growth retardation, Rh sensitization, and postdatism.
4. A reactive NST with possible late decelerations also suggests the need for more frequent NST or CST, or the NST may be repeated the following day. An NST or CST tracing showing variable decelerations of at least 15 beats per minute for 15 seconds or longer in the presence of oligohydramnios indicates umbilical cord vulnerability. These results should be followed by further evaluation or delivery.
5. Prolonged (1 minute or more) and deep (below 90 beats per minute or 40 beats below baseline) decelerations are predictive of intrapartum distress, and delivery of the term fetus should be considered.

**E. Follow-up**

1. A nonreactive NST is generally followed by a CST. A positive CST result suggests that the NST nonreactivity is a consequence of hypoxia-induced acidosis, whereas a negative result implies that the NST nonreactivity exists for another reason. Such reasons include a premature fetus, a fetal sleep cycle, or preexistent neurologic damage. A nonreactive NST and positive CST may predict a serious fetal malformation, and ultrasonography for anomalies should be considered.
2. Any suspicious or unsatisfactory CST, NST, or BPP should be repeated within 24 hours.
3. A positive CST or a BPP score of less than 4 usually indicates that delivery is warranted.
4. If a CST in a premature fetus without pulmonary maturity is positive but the NST is still reactive, consider postponing delivery while frequently monitoring for reactivity and, under certain circumstances, administer glucocorticoids.
5. Delivery of a fetus with an abnormal test result may often be attempted by induction of labor, in the absence of contraindications. If a positive CST result occurs with a nonreactive fetal heart rate, Cesarean delivery is generally indicated.